American Machinist

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The Blanchard Brief for the American Machinist Awards for 1931

On following pages will be found the brief of the Blanchard Machine Company as entered for the *American Machinist* Award for 1931, Class II. Thus we continue to follow out the earnest recommendation of the Committee on Awards to publish all finalist briefs alphabetically by classes.

The selection of this brief as a finalist will surprise no one who reads it in full, and much less those executives of plants whose annual shipments average under one million dollars. The smaller the plant the less free it is to saddle itself with overhead. Henry K. Spencer, Secretary and Manager of Blanchard, divulges an equipment replacement policy so simple and compact and workable that the management of even the smallest plant can adopt it with the confidence that it will decrease rather than increase overhead. Since the eventual results are assured by Blanchard's success, all that any management installing the plan will need is a whole-souled and dogged determination to see the whole thing through.

Every plant sets up annual reserves against equipment depreciation at some rate or another. That being so, no extra accounting or clerical labor can be required to figure all depreciation on a flat basis of ten per cent. But here's where the dogged determination comes in—the reserves must be kept in cash or equivalent so that year in and year out, ten per cent of all equipment is replaced with new. Though stockholders and directors may howl to high heaven, the management will have to stand pat in the full confidence that the best interests of stockholders and directors are being guaranteed.

Mr. Spencer states categorically that the results of the ten per cent plan "have been most satisfactory to the management, to the stockholders, and to our customers."

Continuous Replacement at 10 per cent per year

HENRY K. SPENCER
Secretary and Manager,
The Blanchard Machine Company

Year by year, as a definite going policy, The Blanchard Machine Company purchases new machine tools "amounting in price to at least ten per cent of the replacement price of its machine tools"—any extensions to plant capacity are extra. As a result the age of Blanchard equipment averages but 7.7 years

Brief entered for the American Machinist Award for 1931, Class II. Selected by the committee on Awards for special consideration and publication

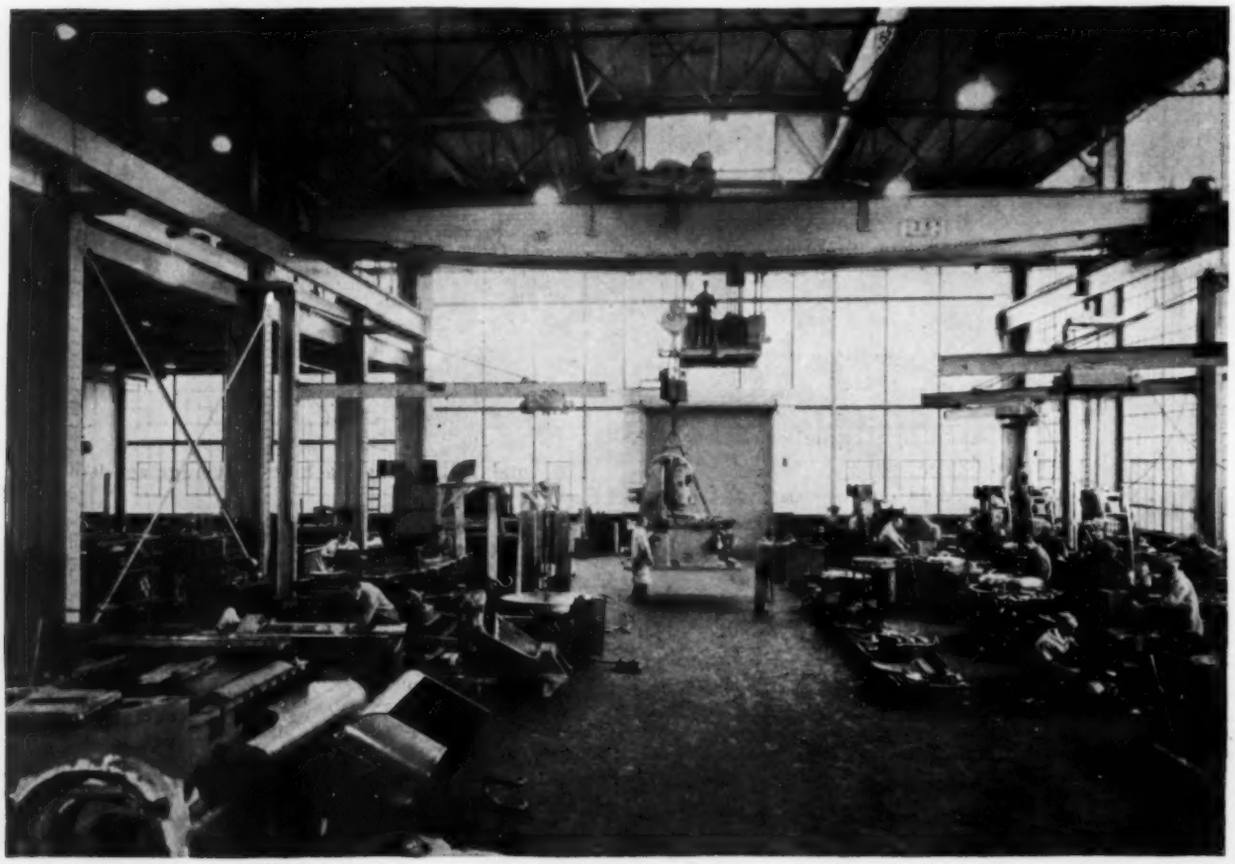
THE Blanchard Machine Company, Cambridge, Mass., makes surface grinding machines of the vertical spindle type. It employs in normal times from 125 to 150 men, has a shop area of 45,000 sq.ft. and during the years 1928, 1929 and 1930 used an average of 1,450,000 lb. of iron castings per year.

Machining and assembling operations in the Blanchard shop are in general like those in other machine-tool shops. The machine tools are standard types, adaptable to a variety of work. No special-purpose, high-production tools are used, because the work is in small lots and frequent changes of work are made on each machine. The machine-tool equipment as of July 1, 1931, is listed in an accompanying table. The photographs show the erecting floor, three views in the machining departments and a planer that is typical of the kind of new tools purchased. This planer has two heads on rail and two side heads, rapid traverse, forced lubrication to ways, and reversing motor drive.

The replacement policy of the Blanchard Machine Company is to purchase in each year new machine tools amounting in price to at least ten per cent of the replacement price of all its machine tools. Extensions of plant are in addition; the ten per cent is replacement only.

This policy was adopted in 1923 for the following reasons, which are believed still to hold true:

Erecting shop, main floor. No. 16 and No. 16-A Blanchard grinders at right



The portion of the erection shop under the gallery, showing assembly of grinder head and column units

1. It is usually profitable to replace a ten-year-old machine tool.
2. Money set aside to cover depreciation should be spent at once for new machines, because
   a. Depreciation and obsolescence are continuous and must be continuously met by replacements, otherwise the shop will be increasingly handicapped as compared with shops whose equipment is up to date.
   b. Money invested in modern tools earns more than when invested in securities.
   c. Depreciation reserves, allowed to accumulate instead of being promptly used for their intended purpose, offer a temptation to use the money in other ways.
   d. There is less resistance on the part of directors and stockholders to the regular purchase of some equipment each year, than to occasional large expenditures for equipment.

The ten per cent minimum figure suits our conditions. In some other industry a different percentage of replacement might be preferable. The essence of the policy is not the mere rate of ten per cent; it is continuous replacement, purchasing at least a certain minimum amount each year, this amount being a definite percentage of total replacement cost. With our ten per cent depreciation rate and the experience that it is usually profitable to replace machines ten years old, it seemed wise to set the minimum replacement at ten per cent per year.

List of Machine Tools as of July 1, 1931

DRILLING MACHINES

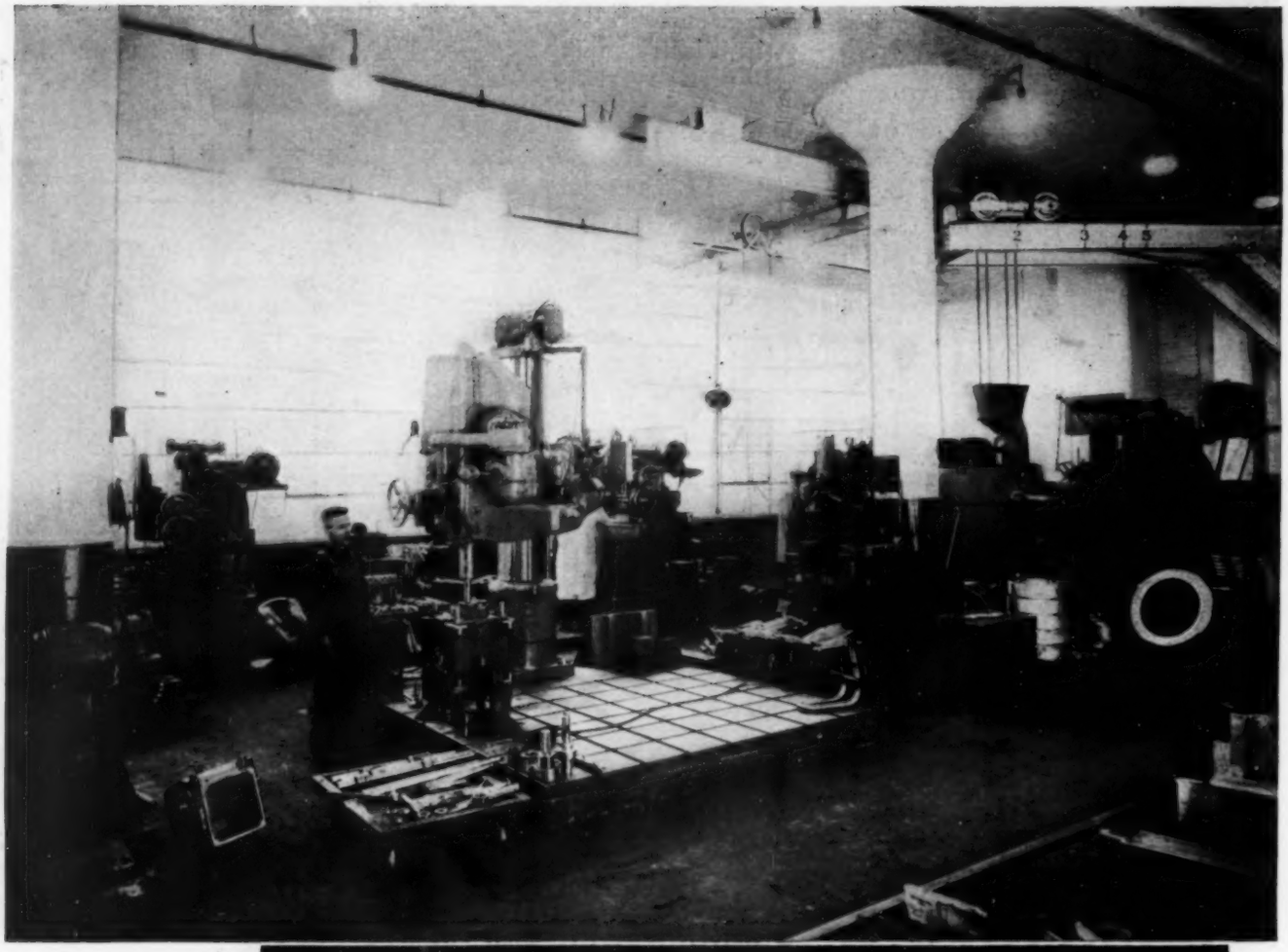
	Age July 1, 1931
21 in. Upright	22 yr. 8 mo.
21 in. Upright	22 " 9 "
No. 1½ Deep Hole Drilling Machine	12 " 7 "
4 ft. Plain Radial	11 " 7 "
4 ft. Plain Radial	10 " 11 "
No. 2 Ball Bearing Sensitive 2 spindle	6 " 5 "
21 in. Sliding Head Upright	3 " 7 "
5 ft. Radial Drill with special floor plate	3 "
28 in. High Speed Upright	2 " 4 "
No. 2 2-Spindle Sensitive	2 " 1 "
26 in. Upright	2 " 1 "

Total 11 Drilling Machines—average age 9.09 years

LATHES

No. 4 Bench	25 yr. 8 mo.
14 in. x 6 ft. Engine	21 " 1 "
18 in. x 8 ft. Selective Head Engine	10 " 6 "
18 in. x 8 ft. Selective Head Engine	10 " 6 "
16 in. x 36 in. Toolroom	6 " 3 "
12 in. x 6 ft. Cone Head Toolmakers	5 " 3 "
20 in. x 12 ft. Heavy Duty Engine	2 " 10 "
18 in. x 8 ft. Heavy Duty Engine	2 " 2 "
18 in. x 10 ft. Heavy Duty Engine	2 " 2 "
18 in. x 10 ft. Heavy Duty Engine	1 " 8 "
24 in. x 12 ft. Heavy Duty Engine	1 " 8 "
11 in. x 4 ft. Speed	1 " 7 "

Total 12 Lathes—average age 7.61 years



Boring mills form a background for the large radial

Drill department. Blanchard has 11 drills with a mean age of 9.09 years

Grinding department. A new cutter grinder reduced some sharpening times as much as 75 per cent

TURRET LATHES

2¼ in. x 24 in. Flat Turret	7 yr.	11 mo.
No. 2—18 in.	21 "	5 "
36 in. Vertical	13 "	
2¼ in. x 24 in. Flat	8 "	2 "
42 in. Vertical	8 "	1 "
3 in. x 36 in.	5 "	1 "
No. 4A—4½ in. Bar Capacity	4 "	7 "
No. 4—1½ in. Bar Capacity	3 "	7 "
42 in. Vertical	3 "	3 "
No. 2L Heavy Duty	2 "	11 "
3 in. x 36 in.	2 "	5 "
36 in. Vertical	2 "	4 "
4A—4½ in. Bar Capacity	2 "	3 "
2¼ in. x 24 in.	1 "	9 "

Total 14 Turret Lathes—average age 6.19 years

PLANERS AND SHAPERS

24 in. x 24 in. x 6 ft. Planer	25 yr.	1 mo.
24 in. x 24 in. x 10 ft. Planer	14 "	9 "
48 in. x 36 in. x 12 ft. Planer	14 "	
20 in. High Duty Shaper	8 "	2 "
48 in. x 36 in. x 12 ft. Planer, 4 heads, reversing motor drive	5 "	1 "
48 in. x 36 in. x 12 ft. Planer, 4 heads, reversing motor drive	2 "	4 "

Total 6 Planers and Shapers—average age 11.56 years

MILLING MACHINES

No. 5 Plain Horizontal	11 yr.	11 mo.
No. 4 Vertical	11 "	3 "
No. 1M Universal	8 "	7 "
No. 3 Plain Horizontal	8 "	2 "
No. 1½ Hand	5 yr.	3 mo.
No. 2M Plain Horizontal	3 "	5 "
No. 5 Plain Horizontal	3 "	
No. 2M Plain Horizontal	2 "	2 "

Total 8 Milling Machines—average 6.71 years

GRINDING MACHINES

8 in. x 36 in. Saddle Type Cylindrical	1 yr.	7 mo.
No. 2 Plain Cutter	1 "	3 "
No. 16A Automatic Surface	8 "	6 "
No. 16 High Power Vertical Surface	4 "	10 "
No. 16 High Power Vertical Surface	3 "	9 "
No. 2 Surface	21 "	4 "
No. 70 Internal	12 "	2 "
14 in. x 50 in. Plain Cylindrical	11 "	7 "
No. 51 Drill Pointer	5 "	3 "

Total 9 Grinders—average age 7.80 years

HORIZONTAL BORING MACHINES

No. 44 "Tri Way" Horizontal	5 yr.	3 mo.
No. 32 Horizontal "Bordrilmil"	2 "	

Total 2 Horizontal Boring Machines—average age 3.65 years

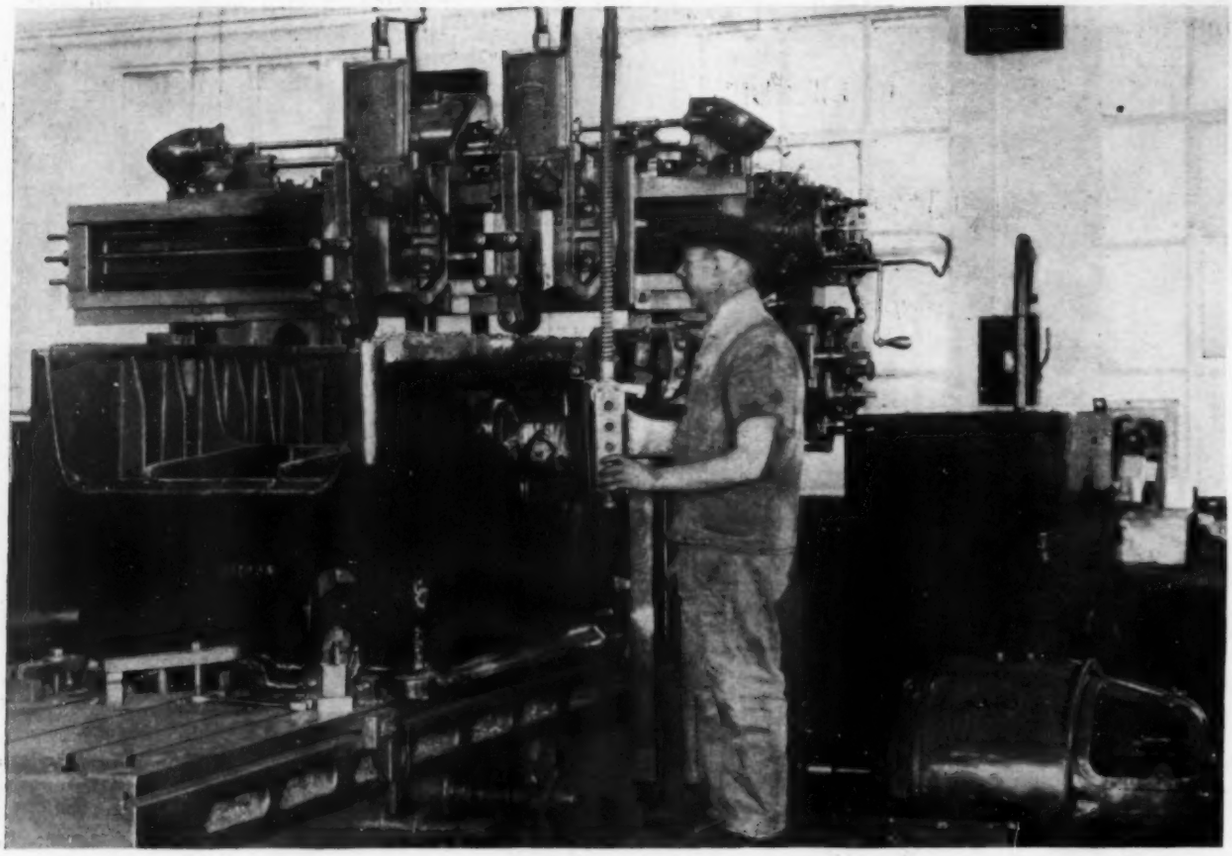
GEAR SHAPER

No. 64	5 yr.	10 mo.

Total 1 Gear Shaper—average age 5.83 years

Total 63 machine tools—average age 7.7 years

The application of the policy is simple. Knowing that some new tools will be purchased each year, the shop superintendent keeps a perpetual list of tools whose age, condition, or efficiency relative to that of the new models



The new planer, at work on a base for a No. 16 Blanchard grinder

indicates their need for early replacement. From this list the items are selected whose replacement promises the greatest gain. Each is then studied, and if little or no certain profit will result from replacement, that item is dropped for the moment and another taken from the list. Formulas and periods within which the machine must save its cost are not used. They are difficult to apply to general-purpose tools operating on a variety of work in small lots. In selecting new tools consideration is given to such factors as accuracy, ease of operation, ease of maintenance, adaptability to a variety of work, floor space required, reputation of the maker for quality and service, and cost of tooling. The relative importance of these factors may be different in each case.

Typical Replacements

Some typical replacements and the savings made are the following:

A slightly heavier turret lathe, with power traverse motions, reduced the machining time on a clutch pulley from 91 min. to 51 min., a reduction in time of 44 per cent.

A new cutter grinder reduced the time of sharpening 14-in. face-milling cutters 75 per cent. and other cutters in nearly the same proportion.

A new radial drill with a special large floor plate reduced the time for drilling a lot of 30 grinder bases from 129¼ hours to 89 hours, a saving in time of 31 per cent. This radial drill may be seen in the foreground of one of the illustrations. The same machine made a reduction of 42 per cent in time of drilling gear boxes.

The new planer, also illustrated, reduced the time of planing a grinder column 17 per cent and improved the accuracy so that scraping time was reduced.

A new horizontal boring machine reduced the time of boring wheel heads 37 per cent.

Many other examples might be cited, but such figures do not tell the whole story. The new machine tools are so much more productive that on the average two new machines have replaced three old ones. This has reduced congestion and afforded needed space for better handling of material.

Maintenance costs have been reduced and down time of machines greatly reduced. An additional advantage in using new machines is that repair parts are in stock, and can be obtained quickly when needed.

The men like to operate the new machines, take more pride in keeping them in good shape, and can produce a more uniform quality of work because the new machines are less fatiguing to operate.

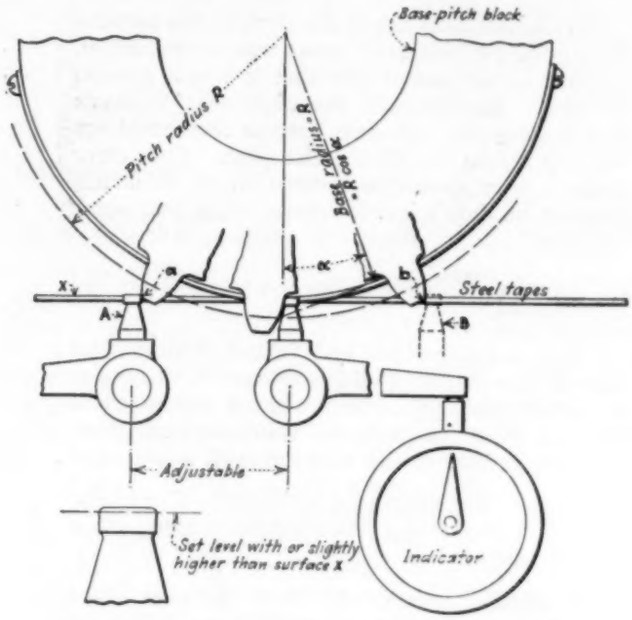
The results of this policy have been most satisfactory, to the management, to stockholders, and to customers.

A Gear Cutter Comparator

Discussion

FRANCIS W. SHAW
Gear Consultant, Heywood, England

A modification of Sam Trimbath's device is suggested



When the gear or cutter blank is rolled on its base circle, straight-sided gaging contact points may be employed

AFTER reading the interesting description of his method for testing the tooth accuracy of cutters of the Fellows type (*AM*—Vol. 75, page 296), I am left wondering why Sam Trimbath adopted, as a basis for the check, the tooth of a rack of the nominal pressure angle of the cutter. I say "nominal" because to a cutter of the type being discussed may be assigned any pressure angle we please, within certain limits.

If then, we have a choice, why not select that pressure angle which will best facilitate the production and adjusting of the testing device? It appears to me—the principle of it is not new, having been incorporated into a form testing machine by an English firm of gear specialists—that the device here illustrated offers advantages over Mr. Trimbath's.

The pitch block is as in Mr. Trimbath's scheme, but instead of its diameter being equal to the pitch diameter of the cutter to be tested, it is equal to the diameter of the base circle—that is, to the base diameter. And the cutter, therefore, rolls in relation to the steel tapes upon its base circle instead of upon its pitch circle (or rather its nominal pitch circle), for the base circle by the change has become, for testing purposes, the real pitch circle. This being so, the pressure angle is now zero and the angle of our testing rack tooth must be zero to correspond.

As the base pitch block rolled along the steel tapes, two points *a* and *b*, located on the sides *X* of the tapes, which of course, are tangential to the base circle, would trace out upon the gear blank (or cutter blank) two opposing tooth profiles of truly involute form. It follows, then, if these points were situated upon the styluses *A* and *B*, the points would accurately touch the profiles of two teeth of a theoretically accurate gear rolling with the pitch block.

If the styluses were mounted in levers as shown, any error in tooth form would immediately be disclosed by the two clock indicators, each indicator revealing the error pertaining to the side of the tooth to which it connects through the bell-crank lever. (To save space only one clock indicator is shown.)

A little thought will convince that small errors in the adjustment of the styluses will make no appreciable difference to the reading of errors. The distance of rolling should be restricted so that movement is through the involute portion only of the profiles, though if the apparatus were provided with the additional indicating device of Mr. Trimbath's scheme, the form of non-involute portions of the profiles could be tested by comparison of the movements of the hands of the clock indicators with those made when an accurate master is in position.

Unlike Mr. Trimbath's apparatus, this device can be utilized also for testing the accuracy of the tooth spacing, for it may be assumed that if sufficient accuracy were indicated by testing first, say, across blocks of 5 teeth, then of 4, then of 3, and then of 2, there would be little probability of the spacing being appreciably unequal.

Cutting Coarse Pitch Screws

ROBERT S. ALEXANDER

Sometimes it is necessary to cut a coarse pitch screw in a light lathe. Then it is better to reverse the usual order of procedure and to make the lead screw drive the lathe spindle. By this means, coarse pitch screws can easily be cut without putting too much strain on the change gears.

Where the lead screw extends a suitable distance from the gear train, a pulley can be put on the end of the screw. Either a cone pulley or a single one will do, but the cone pulley will give the greater range of speeds. A belt can be run from a pulley on the countershaft to the pulley on the lead screw.

Where the lead screw does not extend far enough beyond the gear train to attach a pulley, a special quadrant plate can be substituted for the regular one. It can be made to carry a stud on which a gear and a pulley are mounted, the gear and the pulley being keyed to a sleeve running on the stud. The stud can be adjustable in the quadrant plate, so that the gear can be meshed with any one of the gears in the train. Both methods have been tried and have proved successful.

The Foreman's Round Table

Traffic Congestion

AL went up on the porch of his friend Ed's house and rang the bell. Ed had been in bed for several days by strict orders of the doctor. Ed's wife Minnie came to the door. "Good evening, Mrs. Graham, how's that husband of yours?"

"Good evening, Mr. Morton. He's getting well if crankiness is any indication. Go right up to his room. Turn the key in the outside of the door. He insisted he was going to get up, so I locked the door on him."

"Hello Ed, I see the doctor got you at last," Al exclaimed as he entered Ed's bedroom. "I told you he would. Is it safe for a friend to sit down and talk awhile, or had I better go outside and yell through the keyhole?"

"It's so darn pleasant to hear a man's voice that I am willing to put up with almost anyone. I would even be glad to listen to Williams."

"Fine, I'll ask Williams to come down and bring some of his latest rules. I know you will be interested."

"Yeah? It would be like you to hit a man when he's down. But tell me, what's new down at the shop, how's my department getting along? It was a mess when I left."

"So I hear."

"What do you mean?"

"It seems someone told Williams that some job was hung up in your department. Williams went in to see you, and, as you were out, he asked the shop clerk about the particular order he was after. The clerk told him that it had been interrupted four times, twice it was on a machine and was taken off. It seems your clerk showed hours and dates. Did you have him do that, Ed?"

"Nope. I knew he usually had the dope, but I didn't know he kept records. Good for him."

"I'll say good for him. He sure saved your neck."

"How could he save my neck? It wasn't my fault."

"No it wasn't, but the production clerk is a better explainer than you are, and always has Williams' ear. Say, how about letting me have that clerk?"

"Not on your life. But what did Williams say; was he satisfied?"

"I'll say so. That clerk of yours started something. Maybe I ought not to tell you this for fear you'll fire him, but if you do I'll take him on. Williams is going to issue an order on it, and you'll get the credit for it."

"How come, Al?"

"Well, Williams asked the clerk if the particular job he had inquired about was an exception, and the clerk showed him that it was a general practice. Furthermore, the clerk told Williams that it made the men sore, because they could not see any reason for all the changing. Your clerk made a very favorable impression on Williams, because he didn't knock anyone. He just stuck to facts."

"I'm glad Williams found out about it. It had me worried."

"Yes, and if you had been in and Williams had talked to you, you would have started to rave at the production department without any proof to back up what you said, and Williams would have left with the impression that the fault was yours."

"Yeah? But what good is the rule going to do? You can't cure things like that with a rule. What does it say, anyhow?"

"I thought you would want to know, so I brought along a copy to read to you. It's not final; you can make any suggestion you wish. Here goes. 'Subject: Changing Jobs. When, for any reason a job is stopped, or transferred from one machine to another, the shop clerk will send in a report similar to the bad work report already in use. Like the bad work report, stoppage reports will not be used as the basis for criticism, but are intended to record and explain the reason for lost time. In making out the report, specify whether the man was changed from one machine to another, or whether the job was changed from one machine to another, and the reason, when possible. A lengthy explanation is not necessary; merely, Job changed, Man changed, Rush job, etc.'

"Here Ed, I'll leave this with you to put under your pillow. Sweet dreams."

Is there any excuse for stoppage of operations, other than failure of tools? Will sending in reports help the matter?

Discussion of Former Topics

Carelessness

I believe Williams has the right idea in imposing a penalty as a means of discouraging carelessness, and believe he is also right in making that penalty more severe for second or third offenses. But the question arises as to who is most capable of analyzing each case and fixing the penalty without favoritism. I am afraid that in many cases executive analysis would not be entirely equitable, since the executive is usually so occupied with weightier matters as to lose sight of just what may fairly be called safe practice in many minor matters.

The solution, I believe, would be to appoint a committee composed of workmen who are appreciated both for their mechanical ability and their adherence to safe practice, and let them examine and judge each case as it arises. One should not be surprised if such a committee finds an accident chiefly caused by failure on the part of the management to supply proper safety devices and equipment, or even, in certain cases, to the use of unsuited equipment. The words "without favoritism" must not be forgotten, no matter where the blame may logically fall. I have been employed in some places in the past which had their bulletin boards plastered with safety posters, but which harbored unsafe equipment.

—JOHN E. HYLER.

Service or Ability

Continuous service is all to the good with workmen because they do not, as a rule, make many suggestions for new ideas. New ideas are more valuable than service or even ability, and the executive should usually come from outside.

Two shops in the same trade do not often use the same method for similar work, and it pays to get strange ideas. Often, the shop in a strange trade can show better methods still. For example, canning factories, with their own press plant, can often teach the engineering press shop.

A promoted man has a grudge if he is later reduced through unsuitability. It is not fair to fire him if he fails in a strange job. The newcomer can be discharged with less trouble and without injustice. Even if the new man does not fit well into the organization, makes "bloomers," or lacks executive ability, the firm usually gains greatly by at least one new idea.

Inside promotions are also in order, but those men, who make good on promotion, should be encouraged to seek better positions and wider experience outside after a few years. Staleness should be avoided at any cost. Those who leave thus should be welcomed back after three or four years. The higher pay which they will ask is well worth while for the added knowledge they have obtained.

—M. P. DALTON, *Kent, England.*

Service deLuxe

The chief gain in having tool stores open previous to starting time is that the attendants will probably be awake and ready to serve when the buzzer goes. As far as mechanics are concerned there will be little change. Men are persevering and zealous, but not so enthusiastic as to voluntarily increase their working day. Men do not earn big money thus, but by the exercise of intelligence in their methods of work. Besides, the principle is wrong, and one who practiced it would be ridiculed or bullied until he ceased.

To keep open a little after the working day will help the stores keeper. Tools which are hurriedly laid all together can be properly put into place ready for next day. But again, mechanics will not take advantage of it. When stopping time arrives, they have quite enough to do putting away private tools, and washing. The few exceptions who are loth to leave are nothing to judge by. Lots of men arrive at work five or ten minutes early, and immediately start preparing to work, but they are ready to leave at stopping time, and justifiably so. Body and nerve strain make one glad to break away from work at the day's end.

—WILLIAM BRYCE, *Sheffield, England.*

Run-of-Mine

Charles G. Dawes, former vice-president of the United States and now ambassador to England, recently said: "If you work in a profession, in Heaven's name work for it. If you live in a profession, live for it. Speak well for it. Stand for it!" This is how I feel over the mechanical trade, in which I have spent my time from boyhood until now, when I have ceased to boast of how many years I have to my credit. I want to continue to stand for it, but if I am truthful, I must say that all is not well with the trade. I am sure that there are hundreds like myself, to whom there would be no greater pleasure than to see our trade again holding its former high position among the crafts.

There was a time when it was thought that to be a mechanic employment was assured, but to-day, no one wishes to put his son to a trade whose society reports that 25 per cent of its members are unemployed, and of those who are fortunate enough to be employed, a large number are only working part time. Before our trade can again enjoy its past popularity and reputation, it must offer a stable and assured working week.

In these days of jig work, a cheaper and less skilled worker is employed. I think it a mistake to entrust semi-skilled men with elaborate machinery and jigs, which are far more valuable than those any pre-war highly skilled mechanic had. A look around any machine shop will show how badly the machines, and especially the jigs, are treated. Parts that the tool-maker took such pains to make accurate are battered about, without any thought of the consequent errors on production. A man, who has made a jig, would never think of using it so roughly. Watch a man turning, who has built lathes. Note how carefully a man uses a surface plate, who has had the tedious job of hand scraping

it, and the advantage of having skilled men operate costly machines, tools, and jigs will be evident.

Until our trade can offer more stability of employment, our young men will prefer clerical work, where without requiring any special skill or competence, they are assured of a regular wage and an annual leave of absence with pay. Their work is clean, and there are no expenses attached to it such as buying tools, overalls, and the weekly laundry of the latter.

—A. I. Cook, *Essex, England.*

Advice, Gratis

So much depends on the temperaments of both the adviser and advised, that it is difficult to dogmatize. Some men will welcome any advice and proceed to act on it to the very letter. At the other extreme we find men who at the first suggestion of being lectured, as they would term it, seize the opportunity to embarrass the adviser and totally ignore the advice.

Between these two extremes, we find a large body of men who take interest and act wisely.

It will be conceded that advice is necessary to everyone at some time in their career. It follows, that advice ought to be given those in need of it.

It therefore behooves all those who would be sages, to study the temperament of the one they wish to advise and also the value of the advice which is to be imparted. Not from their own point of view, but from that of the one to be advised.

—H. W. Marsden,
Rochdale, England.

Service or Ability

Ability is the vital factor in choosing for promotion. A stranger will sometimes transform a shop, but the same can be said of a man promoted from the ranks. While clever men are obtainable from outside, they are not all outside—some are right on the spot. When it comes to choosing, give loyal, able men a lift if possible. This will spur other employees to qualify for better positions. Promotion for long service is not overdone by any means; it is not practised half enough. The writer's time for advancement has gone by, but experience shows that firms lose quite a lot of money by experimenting with strangers, besides disheartening good men and forfeiting their esteem. Firms can easily suit themselves from their working staff, and the most flourishing firms I know practice this. Unfortunately, they are in the minority; a craving for what is termed "new blood" actuates many, and they often pay dearly for it.

—Wm. Bryce, *Sheffield, England*

Treasure Chests

The writer has been associated with two plants, both automobile manufacturers, which installed suggestion systems. In the first plant, where the installation failed of its purpose, the standards were high. In this plant, there were some 7,000 men, probably of the highest grade ever gathered together in a large plant. The system installed called for the use of suggestion boxes, and for the first week, there were plenty of suggestions.

To insure that the workman's identity would remain a secret, the forms, which were provided in receptacles handy to the suggestions box, were contained in a large envelope and carried a serial number. At the bottom of the form, on which he wrote his suggestion, was a slip carrying the same serial number.

The committee went over the suggestions, passed on their merits, and decided on the award. The reward was based on ten per cent of the sum the suggestion would save in a year. The most we paid for any one suggestion was $25, and most of this was to advertise the system, as that particular suggestion, while good, did not save the amount it represented.

The second week the suggestions shrank badly, and by the third month, none were coming in, so the system was abandoned. In view of later experience, I believe that the causes for its failure were three: lack of publicity, the foreman not being allowed to participate, and no payment unless it actually was a suggestion that showed a tangible saving.

In another automobile concern, where the writer was later employed, practically the same system was started and also fell into disuse. It was later revived and became a success, I believe because of the following change. The foreman, assistant foreman, and salaried workers up to a general foreman, are allowed to make suggestions not only concerning their own department, but any department or division.

About eight per cent of the suggestions are profitable. Once in a while, a real suggestion comes in that saves quite a sum per year.

Suggestions that make small, intangible savings in the course of the year are paid for by giving the employee a credit slip for $2.50. When he has received four of these he can cash them in for $10. About 100 suggestions are received per week, and the results to both the plant and the employees have been satisfactory.

The fact that the foremen are allowed to participate may be criticised by some, but this is defended in this plant on the grounds that the foreman has little to do or say about the layout of his department, the machine tools supplied him, or the design of the tools or fixtures that are given him to use. His job is to operate the department with what is supplied him by the planning department and the management to the best of his ability.

All employees are allowed and encouraged to submit any suggestion about any department or division without criticism. All suggestions of merit, even though they cannot be accepted, are answered and the ones making the suggestions advised of the reasons for their non-acceptance.

—P. W. Abbott.

Run-of-Mine

The correct answer to the problem as presented, can be given by any time-study man or production clerk; and that answer will be, that there is a distinct improvement in the grade of men working in the shops today, and that the shop worker of the present generation is above the average of other occupations, rather than below. To one in my position, the answer would be put as a question. In the past, how many of the old hands were open-minded as regards new methods or materials? How many could be "told" anything? How many were willing to go out and study for promotion.

The improvement has been so great that the only ones who cannot see it, are the same ones who cannot see any advance in our civilization since they were boys. An observing man, in direct contact with the men all the time, cannot help but answer that the workers of today are far better men than those in the past, and that unless there is something wrong with a company, good men are plentiful. —Charles R. Whitehouse.

Standards Engineer,
Holtzer-Cabot Electric Company.

All machines in this plant of the Worcester Pressed Steel Company are painted yellow of a shade which reflects considerable light but does not show soil readily

Will Colors on Machines Pay?

An honest endeavor to ferret out and present the facts underlying this much-disputed question. At first thought, the idea of introducing yellows and blues and greens into a metal-working shop may seem foolish, but it quite evidently produces profitable results

HERBERT CHASE
Consulting Engineer

▼

SHALL color pervade the shop? Can it bring any advantages that will be reflected in better work or in reduced costs? If so, what colors shall be used? Shall machines and other equipment be considered in the color scheme?

These and related questions are being asked by forward-looking shop executives. Some have found answers through practical experiments. Most of those who have tried color, especially on machines, are inclined to be enthusiastic about the results. Others contend that it is largely or wholly a matter of taste—and tastes do differ!

Those who have tried color, especially on machines and equipment, contend that:

1. Color tends to decrease eye-strain; this helps to avoid nervous tension and to reduce fatigue.

2. Colors, particularly in the lighter hues but in any case affording some contrast with the work, improve seeing conditions.

3. Color tends to promote cleanliness, to make a shop more cheerful. This tends to improve the morale of workers and to promote pride in keeping machines and equipment clean and in better condition.

4. With properly colored machines in use, the accuracy of work increases. The percentage of defective work is considerably decreased.

5. Whether the worker realizes it or not, he tends to work more rapidly on a colored machine than in one finished in black. If the same rate of production is maintained on a black machine, the quality of work is usually inferior.

6. Fewer accidents occur when machines are painted in colors.

7. There is a definite advertising value in a clean, well-painted shop. Visitors carry away a good impression. They are likely to remember appearances even if they forget about items of more importance.

This is an impressive list of advantages, especially when it is set off against such rather unconvincing disadvantages as:

1. Colors are contrary to precedent. Black and gray seem more in place in the shop.

2. Original finishing and refinishing are more expensive if colors are used, especially if light colors which show soil more readily are employed. In that case refinishing is required more often.

3. Machine manufacturers object to furnishing special colors. It is easier and cheaper for them to finish in one standard color, and involves less bother.

4. The psychology of color is an intangible thing, difficult to measure in terms recognizable by men in the shop.

Before discussing these advantages and disadvantages further, some specific experiences may be cited. For

some of these I am indebted to T. J. Maloney of the New Jersey Zinc Co., who has made an extended study of the subject. It so happens that much of the evidence secured to date comes from shops not engaged in metal working. There seems to be no reason to doubt, however, that similar findings apply to metal-working shops —or would if color were employed—as conditions are substantially parallel. Nevertheless, many metal-working shops are using color and more are planning to do so.

An ultramarine blue has been used extensively on machines in the Ford plant and by the Timken-Detroit Axle Co. It gives a striking effect and does not show dirt easily, but is not a good light-reflecting color and consequently not well suited to use in a dark shop. Yellow machinery enamel (Sherwin-Williams No. 376 or Breining Brothers No. 1962) has been used for many years in the shops of the Worcester Pressed Steel Co. on all machine and tool equipment. This color was adopted because of its good light-reflecting qualities as compared to black or gray and because it was the only light color this user could find that does not require constant cleaning in order to keep the machines looking presentable. According to John N. Mowery, general manager of this company, some observers feel that the yellow color is restful to the eye and creates a more satisfactory atmosphere in which to work, but no tests to establish the validity of this belief have been made in the Worcester plant.

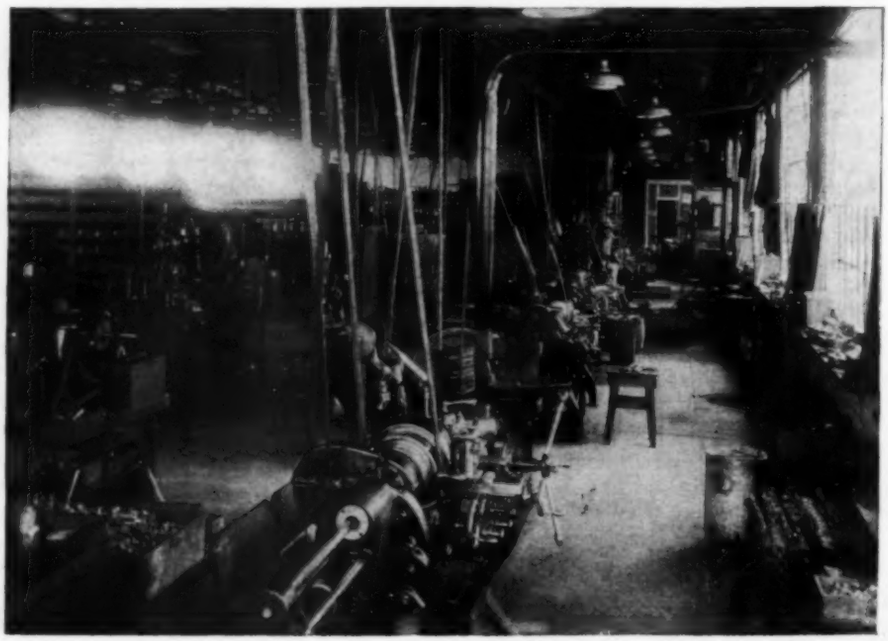
Tests made by the Munsell Color Co. show, however, that yellow and other light colors reflect several times as much light as gray or black in the shades much used on machine tools. A light yellow (considerably lighter probably than that used by Worcester Pressed Steel) has a reflection value of 60.5 per cent, as against about 11 per cent for a gray approximating "machine tool gray" and less than 2 per cent for black. There can be no doubt, therefore, that a shop in which the machines are finished in light colors will appear and actually be lighter than one in which the machines are finished in the conventional gray or black, the quantity of light supplied and other factors except machine color being the same in both cases.

Ford uses egg-shell white to reflect light from the upper portion of walls, ceilings and girders at the River Rouge plant. The ultramarine blue, known there as "machine blue," is used on all machine frames, housings, safety covers and sheathings. Walls are finished in deep gray to slightly above wainscoting height. Stock bins, racks and timekeeper's desks are olive green. Railings are black. stacks and furnace and oven exteriors are coated with aluminum paint which resists heat. All fire appurtenances and first-aid station notices are in red. Painting goes on continuously. The exterior parts of machinery are painted perhaps most frequently. The amount of "machine blue" applied at the Rouge Plant each month will exceed 5,000 gallons. That is enough paint to give a single coat to a fifth that many medium sized cottages. And almost 11,000 gallons of egg-shell white are used monthly.

At least one large machine tool manufacturer has long used bright yellow on crane hooks to make them stand out, and is planning the use of color in other ways. The Gleason works has experimented with various shades of green and blue. Results are regarded as a matter of opinion, and no effect upon output has been measured. It is agreed there, however, that a fairly dark color is necessary in order not to show oil discoloration too prominently. Some machine tool builders paint the interial of machines a light color as an aid to accuracy in machining and assembly.

At the Armstrong Machine Works, Three Rivers, Mich., machines, benches, bins and stools are painted olive green. This color, according to the factory superintendent, L. G. Patterson, is very restful to the eyes, easy to keep clean, and gives the machines a new look that lasts longer than the original standard gray. Repainting costs are not high, Mr. Patterson reports, when balanced against results secured. A 14-in. by 6-ft. lathe takes about two hours to clean with hot soda water and wipe off with gasoline, leaving the surface ready to paint. One hour of labor and a half-pint of quick-drying lacquer complete the job. This is a well-lighted shop and visitors always remark about the light and cleanliness. It is conceded that a darker shop would not benefit by the use of so dark a color.

In the plant of the Simonds Saw & Steel Co., several machines have been painted orange on stationary parts and black on moving parts. This gives not only a much neater appearance to the room, but has been very acceptable to the men. Tests are reported to have shown that the workman does not do so well on a black machine as on an orange-colored one. If he tries to increase his speed on the black machine, his workmanship deterio-



A portion of the Armstrong Machine Works. Machines, benches, stools and bins are painted olive green. This gives them a new look that lasts longer than the standard gray, but would be rather dark in any but a very light shop

rates. If quality remains the same, the work is done more slowly. It is expected that the new Simonds windowless plant will have orange-colored machines, but changes may be made before this plant is put into operation.

Some of the most convincing items of evidence in favor of color come from a shop in which radio tubes are manufactured and which, therefore, does much metal working as well as operations with other materials. In this New England plant there are numerous operations involving fine wires and other parts that are difficult to see. Partly on this account, rejects of parts and assemblies failing to pass inspection in some cases have amounted to as many as 20 per cent. When a specialist in industrial color work was asked for suggestions, he recommended an orange coloring on a stem machine in which a circle of bluish gas jets was employed. This color enabled the operator to see the jets and the work much more clearly than before. Sky blue was chosen for the benches on which small welding machines are employed, partly to give visual relief resulting from a good background and partly to give the effect of coolness at a point where heat is required in the work. Just below the machines a deep blue spot was painted to afford greater contrast with the bright metals being used. Orange and blue were tried also in other parts of the shop, despite a feeling on the part of the management that the color suggestions were somewhat theatrical.

Employees Find Colors Satisfying

Operators, many of them girls accustomed to drab factory interiors, found the colors alone highly satisfying. Employees in parts of the shop not at first refinished clamored for color in their departments and foremen became so enthusiastic that they did much repainting themselves. Many employees voluntarily bought dusters to harmonize with the colors of the machines. According to the president of the company, "The plant became markedly cleaner. Even more important, shrinkage—that is, rejects, breakage, anything not passing inspection—showed an immediate and marked decrease. On one item the decrease was two-thirds in one week. Every cent spent for refinishing has more than paid that expense in dollars."

Very similar is the evidence of beneficial effects produced by the use of color in the plant of E. T. Wright & Co., Rockland, Mass. Although its product, shoes, is not in the metal-working class, it contains row on row of black machines, as do many New England and other metal-working plants. Complaints of severe eye strain arising from efforts to see a black product against a black background led Alfred W. Donovan, president of the company, to have some machines painted in light green. Eye strain disappeared, workers improved production rates and reduced spoilage. Many other light colors were tried and found acceptable. To assure a reasonable degree of color harmony in various departments and still avoid a sameness throughout the plant, experts studied the results and recommended the following color combinations: orange and black, gray and blue, ivory and green, orchid and black, tea-rose and orchid, foam green and fern green, French blue and valley blue, desert brown and beaver brown. Stationary parts of machines were painted in contrast to moving parts.

Executives, foremen and workers are often skeptical or even antagonistic to the use of color in the shop, but once it is tried all hands seem to be enthusiastic about the change. So far as workers are concerned, the effects may be considered by some as largely psychological. The results, however, are tangible and merit study wherever machines are employed.

Fixed rules concerning the selection of color are not readily formulated, but these few elementary factors may be outlined. The lighter colors reflect more light and are especially beneficial where illumination is not of the best and where they form a background for viewing work of dark color. Bright metals can often be seen best against a dark background, but this need not involve the whole machine. Light colors tend to promote cleanliness, as they tend to reveal the presence of dirt; but they naturally show soil more quickly.

Bright reds are exciting and are not recommended except on small areas to denote danger. Orange and yellow create a feeling of warmth and cheerfulness. They are well suited for use in shops that tend to be cold or have chiefly north light, but need not be confined to such use. Green is a cool restful color, excellent for bright sunny rooms. Its lighter shades are useful even in rooms that tend to be dark. Blues are cold colors and thus seldom recommended for cold surroundings. They are used to advantage in rooms that tend to be hot, as where much heat is required for the process in use, or where heavy physical work is done. Black and white and the intermediate shades of gray are without color in a strict sense. Black has the lowest and white the highest light-reflection values and should be used with due regard to this fact. Grays are neutral and, except in the very lightest shades, have low light-reflecting values. In the much-used darker shades they do not show soil readily and for this reason more or less invite accumulation of dirt. In certain cases gray affords a fairish background, but in most instances has little to recommend its use.

Advantages of Color Often Real

Judging from these experiences, the advantages claimed for the use of color on machines have been well sustained in at least some instances. There is a strong presumption that the same will prove true when colors are used more extensively in shops where metal products are produced. Since the cost of refinishing most machines is quite low and can be done in slack periods by almost any workman of reasonable skill, experiments on this line may well be undertaken now, at least on a small scale, in a great many shops.

As to the disadvantages, that relating to precedent can be brushed aside. If colors are beneficial, they are bound to be employed, even though custom may rule temporarily. A little more care is often required to produce an acceptable job when light colors are used, but the better visibility and higher light-reflecting value of the light colors, as well as the better background they often afford, are well worth the difference. If somewhat more frequent refinishing and cleaning is required, they appear to be offset by the fact that workmen take greater pride in and better care of an attractively painted machine. Oil staining may not be entirely avoidable, but can be minimized by a proper selection of finishing materials.

It is true that the use of one standard color is convenient and least expensive for the machine builder. It is in his interest, however, to give the customer the most acceptable product, and if this involves a little bother in finishing, it is well worth while. Certainly no manufacturer is likely to let it stand in the way of increasing his sales.

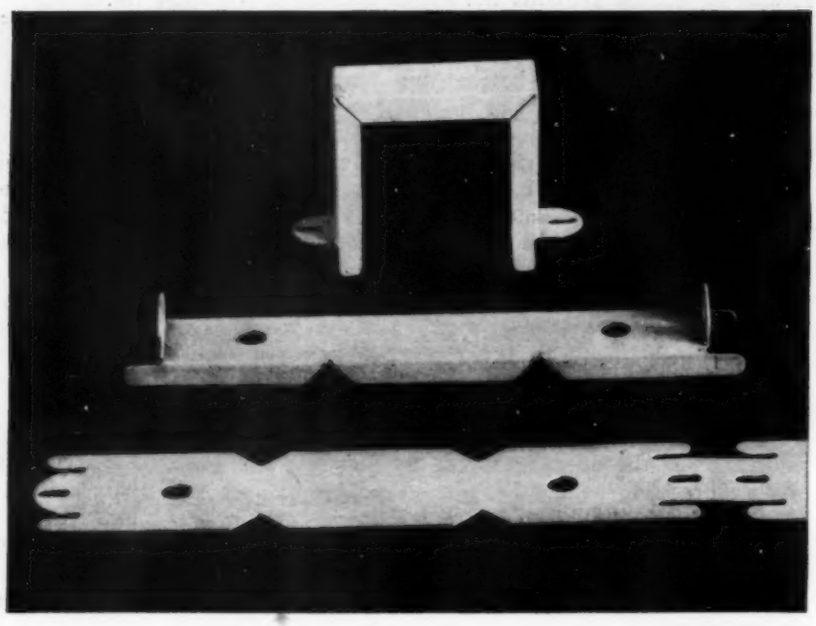


Fig. 1—Two of the three operations are performed in a single die that combines the good qualities of several types and makes an accurate part with economy of material and labor

A Die for Notching and Forming

C. W. HINMAN
Chief Tool Designer,
Kobzy Tool Company

THIS description and the accompanying illustrations set forth a practical method of producing steel frames used for mounting small transformer coils in radio sets and similar apparatus.

The material used for the frame is dead-soft open-hearth steel 0.0375 in. thick, sheared to $1\frac{7}{32}$ in. wide. The die is a follow die, made on the notching principle, which uses strip of the exact width and produces a minimum of scrap.

Having no other data than the finished dimensions, the

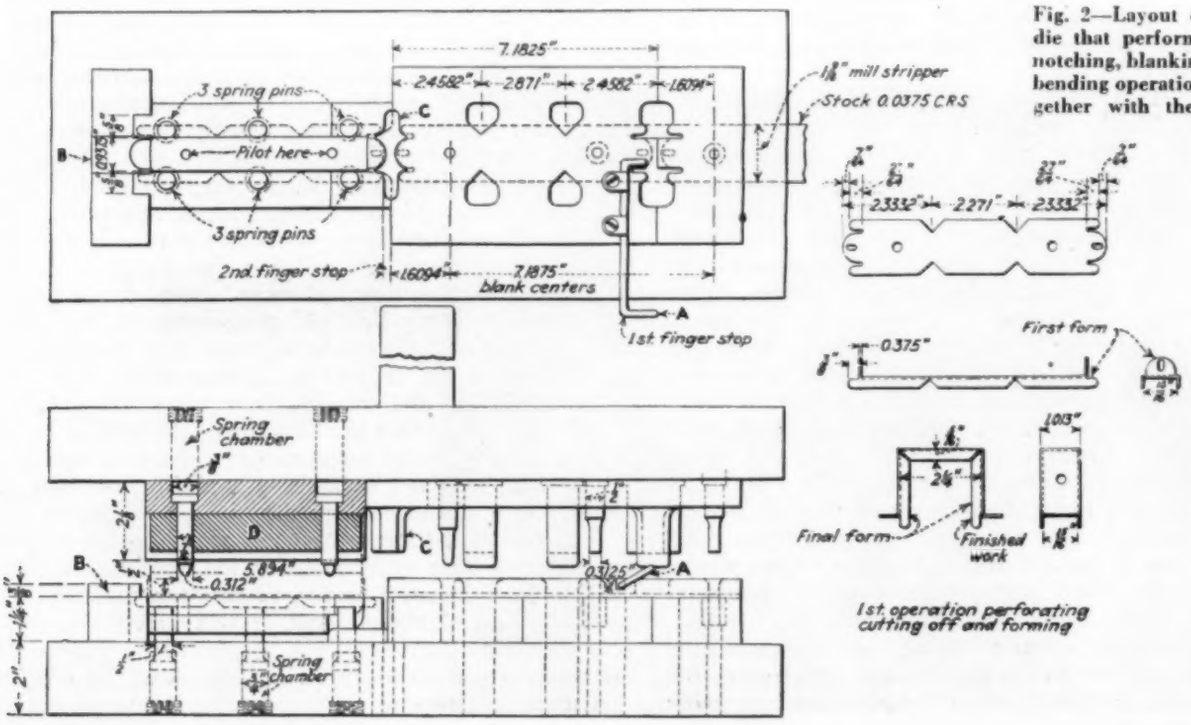


Fig. 2—Layout of the die that performs the notching, blanking and bending operations, together with the part

designer, as is usual in such cases, began at the finishing operation, developing the blank and first operation form before proceeding with the die design as a whole. The development of the blank was computed on the usual assumption that the neutral bending line of the material would be at one-third the thickness of the stock, measuring from the inside surface. This assumption was proved correct by experiment before the tools were built. Present-day designing no longer countenances the use of the trial and error method. The three operations are shown in Fig. 1. The cross holes line up accurately and the frames seat without "rock." It will also be noticed that the turned-up edges are even and at right angles to the sides and bottom.

The positive type stripper plate is grooved to a proper width and depth to accommodate the stock, with clearance enough to take care of slit stock, but not enough to allow of misalignment. The fact that the total length of the die that performs the first two operations is 15½ in. helps considerably in maintaining alignment throughout the various operations.

The strip is fed from right to left in the usual way until it strikes the first finger stop. This is shown at *A*, Fig. 2. This finger stop is merely a manually operated stop used for starting each strip. With the material against the stop the punch perforates one $\frac{5}{16}$-in. hole, one of the elongated holes, and notches the ears on the front end of the first blank. This punch is made with a back-up heel which enters the die before the punch begins to cut and thus prevents the punch shearing when cutting on only one side. This punch does not round the ends because the elongated hole would come too near the edge of the die.

After starting, the strip is fed forward to the second finger stop. When the ram descends, a pilot pin enters the $\frac{5}{16}$-in. hole punched in the first operation and registers the strip. The front end is completed by having the $\frac{7}{16}$-in. radius, four 90-deg. angular notches and the remaining $\frac{5}{16}$-in. hole punched. The part, not yet separated from the strip, is fed forward to the final stop *B* which is designed to fit the convex end of the part and which both centers and stops the part.

When the ram again descends all the previous operations are repeated, as is also the first forming operation. In this operation the completed blank is parted from the strip by the punch *C*. As the stroke continues, the sides of the severed blank, as far as the bottom of the angular notches, are bent downward by a straddle punch, and a spring pad. As the pad descends, the two convex ends of the blank are "thrown up" to form the feet. The pad has a bumper on the under side that bottoms against the die shoe. This action "spanks" the different protrusions of the part.

The ram ascends, and the work is stripped from the die by six spring-actuated pins. Should it stick in the punch it is stripped by the pilot pins, which are also spring actuated. The press is tilted and the finished piece slides out at the back. Provision is made for grinding the cutting members when they become dull. The correct relation between the surfaces of the cutting and the forming members is maintained by taking the same amount of stock from the face of the removable punch *D* and from the bottom of the bumper plate immediately below it.

The final operation, folding up the sides, is performed in the usual manner with a punch long enough to clear the drawn-up sides.

Progress of Eye Protection in Industry

The strides that have been made in the provision of goggles to workers in hazardous occupations are best illustrated by two sets of figures. A large electrical products concern reports that ten years ago it spent little more than $100 a year for goggles. Today this company spends in the neighborhood of $100,000 a year for this and other forms of mechanical eye protection. A large optical goods company reports that 15 years ago its sales of goggles and headmasks totaled $50,000 a year. Last year this same company sold $1,300,000 worth of goggles and masks.

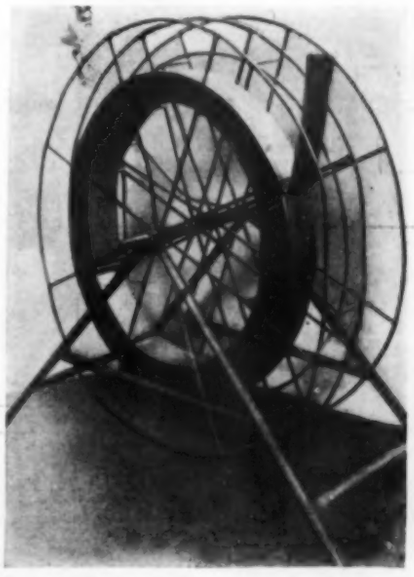
Practically all of this progress, however, occurred in several score big industrial concerns. In the opinion of many men who are continuously in touch with this problem at first hand, the small plant is today no farther ahead than it was ten or fifteen years ago in the matter of providing mechanical safeguards for the eyes of its employees. And in the aggregate, the small plant constitutes the bulk of American industry.

From an address by Lewis H. Carris, Managing Director, National Society for the Prevention of Blindness, before a recent meeting of the New York Academy of Medicine, and the American College of Surgeons.

Handy Reel for Boiler Bands

FRANK C. HUDSON

Banding strips, like coils of wire, can be a nuisance unless kept on racks to prevent uncoiling, tangling or being bent out of shape. To prevent this the erecting shop of the Norfolk & Western at Roanoke has welded up a reel, as shown, for holding two rolls of the banding strips used outside the boiler jackets. These reels are of light construction, hold two strips of band steel and have widely braced feet to avoid being pulled over as the strips are reeled off.



Attention to detail makes for good housekeeping in a railroad shop as exemplified by this homemade reel

Forging High-Chrome Steels

J. B. NEALEY
American Gas Association

STAINLESS or corrosion resisting steels are as a rule, difficult to forge and hard to machine (*AM*—page 455, Vol. 75). Their successful forging depends upon a difficult technique, both in the heating and forming.

No general forging temperature range can be given, as each type has a range all its own, determinable only by actual experience. Ordinary steels are readily forged at red heats of 1,400 deg. F. and up, and the forging pressures necessary for different size jobs can easily be estimated. When chromium or chromium and nickel are added, in the amounts required in stainless alloys, the pressures necessary for forging jump rapidly—two or three hundred per cent or more.

With the advent of the "free machining" stainless steels, the problem of forging became two-fold. Not only must the forge shop consider the fact that it is dealing with an expensive alloy requiring very close control in forging to prevent loss of the stainless and high physical properties or injure the metal due to improper heating, but these steels also are "red short" or brittle at temperatures in or slightly below the forging range.

Considerable experimental work along these lines has been conducted by the Western Forge Plant of the General Metals Corporation, Los Angeles, Calif. This research was conducted by W. A. DeRidder and R. S. Smith, vice-president and general manager, and metallurgist of this plant. They established the fact that one of the most vital points in the forging of stainless is a thorough preheating in a controlled furnace separate but adjacent to the forging furnace, the preheating requiring at least twice as long as for carbon steels. The line of demarcation between the preheat and forging heat is definite and is controlled by keeping the preheat temperature below the carbon precipitation point for the nickel steels and just under the grain growth range for the chromium steels. Rapidity in heating in the second furnace and during reheats while working is one of the most vital factors in forging, second only to exact control of temperature.

Forged "Kelly" bars of stainless steel

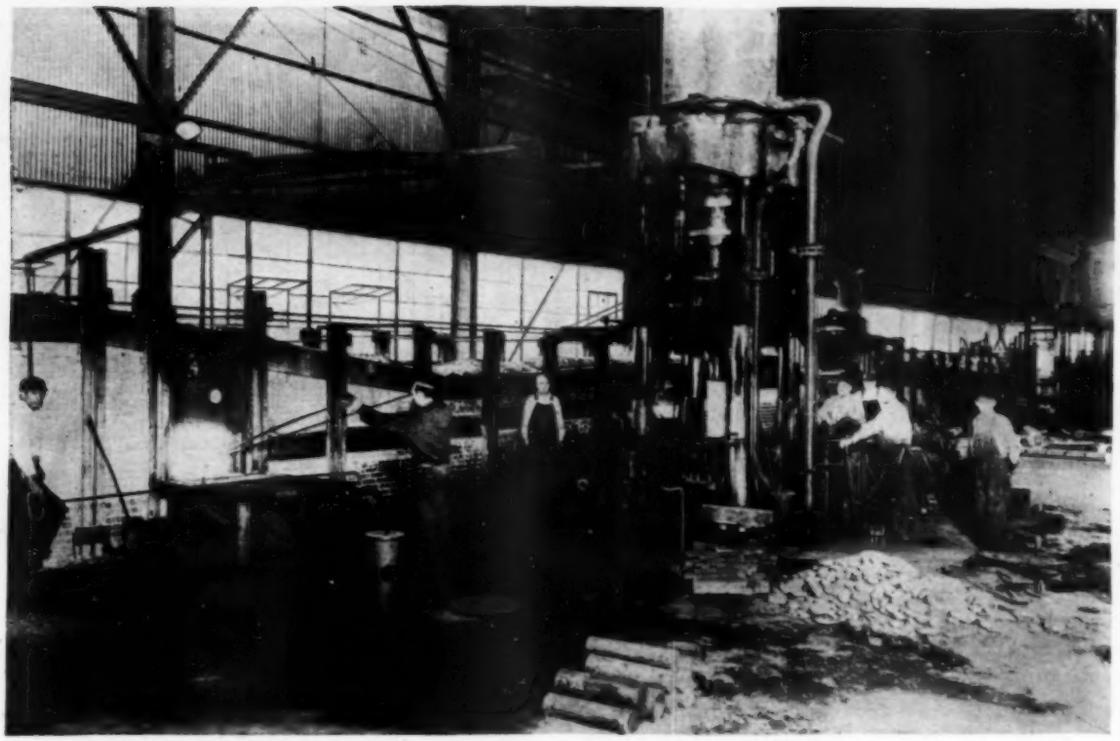
The making of stainless steel golf club heads is a case in point. The analysis of the steel employed is: C—0.12 max., Cr—11.5—14, Mn—0.5 max., Mo—0.25, Si—0.50 max., P—0.025 max., and S—0.4—0.5.

The 0.40—0.50 sulphur makes this a free machining steel but also imparts red shortness which causes the steel to tear if trimmed too cold. Practice here has shown that this steel must be forged within a temperature range of 2,350-2,400 deg. F. and the heat must not be allowed to go below 2,000-2,050 deg. F. while trimming. These golf club heads are forged in a four-stage die, then trimmed.

With very accurate control it is possible to use this method with great success, but the risk is great when temperatures are not automatically controlled, due to the fact that the forging temperature is very near the melting point or "burning" point of forging. Below 2,000 deg. F. the forgings are exceptionally brittle or "red short" and will break or tear if trimmed hot.

Through later experimenting it has been found that forging this type of steel can be done with greater success at temperatures of 2,100-2,200 deg. F., cold trimming the forging after an accurate anneal at 1,600 deg. F,. then slow cooling. This renders the steel exceptionally soft, but gives good trimming and machining properties. The last-named method is the most economical, due to the increased production possible when cold trimming, and to the fact that the forgings must be annealed anyway to produce machining properties.

Chrome-nickel steels of the 18-8 series are used in this plant in making welding flanges up to 300 and 400 lb. in weight. The analyses are: C—0.07 max., Mn—0.35—0.70, Si—0.3—0.7, Cr—17—20, Ni—8—10, P—0.25 max., S—0.25. Billets of this analysis cannot be forged at temperatures below 1,800 deg. F. and not above 2,150 deg. F., and require three reheats during forming. The volume of product made is too small to warrant the expense of sinking dies, so the work is per-



Two long, continuous, gravity, feed forging furnaces with side-door discharge. They heat billets for two extrusion or piercing presses

formed in an open frame hammer and includes forming, piercing and upsetting the flange. At all times during the forging of this type of alloy a metallurgist is on duty with an optical pyrometer to make sure that the forging at no time drops below 1,800 deg. F. Just one cold check could send a hundred dollars worth of metal to scrap.

Practically all known steels and alloys are forged by this concern, consequently selecting and forging are under laboratory supervision. Products include large gear blanks, crankshafts, fishtail bits, steel shafts up to 45 in. in diameter, drill collars, Kelly bars up to 60 ft. in length, and mandrelled rings up to 5 ft. long and 5 ft. in diameter. The plant has a complete die sinking and machine shop and is divided into two main divisions, the drop forge department and the press forge department. The former has nine hammers, ranging from a 10,000-lb. steam hammer to an 800-lb. board drop. There are also two large billet shears and a complete pickling set-up, in addition to the gas-fired forge and heat-treating furnaces.

The press forge department is equipped with a 1,000-ton forging press, 1,000-ton piercing press, a 750-lb. piercing press, and two steam hammers. Besides the gas-fired furnaces there are large circular metal saws, and welding, cutting and chipping equipment.

In the drop forge department, each smaller hammer is served by a gas furnace, while the large hammers have two each, one for the preheat and the other for the high heat. The smaller furnaces are of the slot type, brick construction and steel encased; the hearths are of chrome ore laid in the plastic state 3 to 4 in. thick. The furnaces are 4 ft. sq. and 6 ft. wide (outside dimensions) and stand on 3½-ft. legs. Each is fired with a single gas burner on each side and is equipped with an indicating pyrometer.

The two furnaces serving the largest hammer are of the slot type of brick and steel construction, 7 ft. deep, 7 ft. high and 9 ft. in width. They are heated by a single gas burner on each side, staggered so as not to fire against the other. A portable indicating pyrometer is used as an aid in controlling temperatures. One furnace is used for preheat, the other for high heat.

The 1,000-ton billet forging press is served with three furnaces, for it requires as much as 30 hr. to heat some large billets. Press and furnaces are arranged in a row with a 5-ton billet manipulator operating back and forth on a track just in front and parallel. The furnaces are arranged two on one side of the press and one on the other. They are of brick and steel construction, each about 18 ft. wide, 10 ft. deep and 6 ft. high (outside dimensions) and heated with two gas burners firing from one end. Air preheaters are provided for two furnaces, and indicating pyrometers are used on all.

While the chromium alloys are in process of forging, the hot metal is under constant observation by operators with optical pyrometers. It is returned to the furnaces for a reheat as soon as the temperatures have dropped to the allowable limit. Scale is another difficult factor. One operator is always watching for its formation and immediately removes it before it is forced into the metal.

The open-frame forging hammer utilizes a similar three-door furnace except that a third of the interior space is divided off from the rest of the furnace with a refractory brick wall. The smaller portion is used as a preheat chamber and is kept hot with waste heat from the high-heat chamber.

Billets ranging from 4 to 12 in. in diameter, extruded hot in the big hydraulic presses are heated for 4 hr. in two large furnaces of the gravity feed and side-door discharge type. Of brick and steel construction, each is 60 ft. long, 8 ft. wide, and about 6 ft. high. As these furnaces are heated with two gas burners located at the discharge end, billets coming through from the other end receive the necessary long preheat or soaking which equalizes the heat throughout the billet.

Complete Descaling Before Grinding

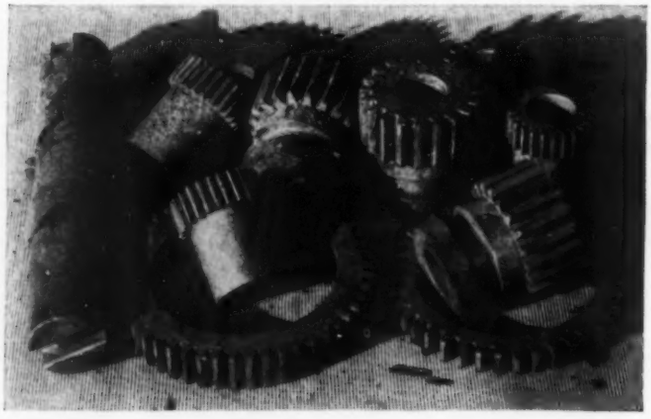
FRANK R. DEDRICK
Foreman Grinding Department, The Bullard Company

AS MAY not be too obvious to some readers, certain definite savings are made when metal is thoroughly descaled before a grinding job is begun. The following data which are taken from shop records covering a considerable period of time, should be found profitable reading.

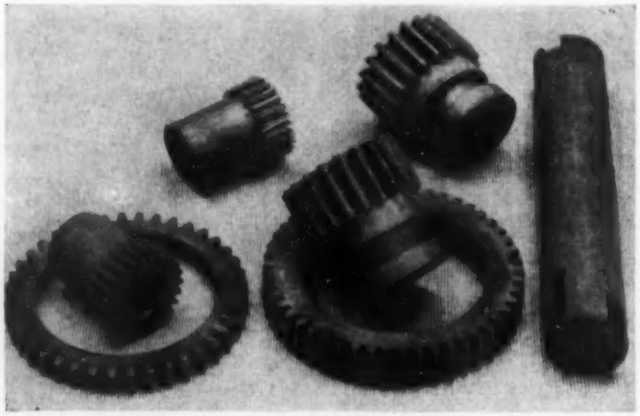
Two methods of such descaling have been practiced in the plant of The Bullard Company: scratch brushing, the original method; and the Bullard-Dunn process which supersedes it. For this reason, the information in this article is tabulated in the form of a direct comparison between these two methods of scale removal.

The unit of time is used, rather than a money unit, to permit the reader more readily to convert the facts. Percentage figures, when given, use the scratch brush method of cleaning as the basis of comparison in order to indicate the savings resulting from the adoption of the Bullard-Dunn process.

The data given in this article are separated into the following general divisions: surface, internal, gear and rack, and fixture grinding.



Scale causes grinding wheels to load and thus impairs grinding



Complete descaling before grinding more than pays

As is generally known, heat is the bugbear of accurate, rapid grinding. And you cannot get away from it if the face of the grinding wheel becomes loaded with scale or sediment. Therefore, complete descaling is essential

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Surface Grinding
Table I

Operation: to remove 0.015 in.–0.020 in. stock from a hardened steel surface

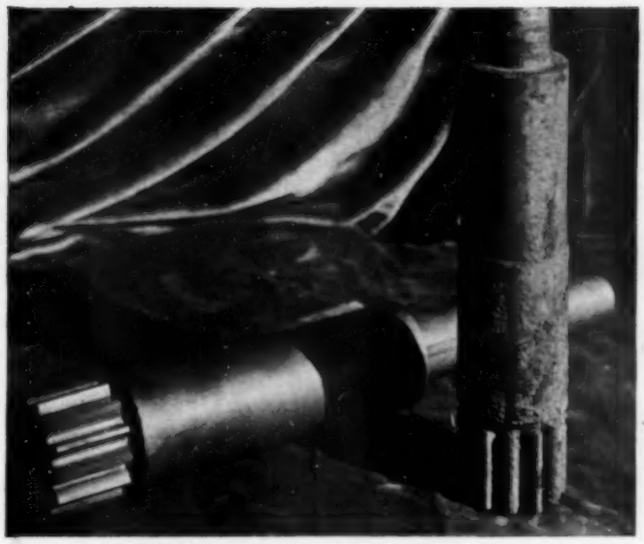
	Scratch brush	Bullard-Dunn
Method of descaling	Scratch brush	Bullard-Dunn
Condition of surface before grinding	Not clean	Entirely clean
Time per piece	54 min.	28 min.
Per cent time saving	....	48
Number of wheel passes	4–5	2–3
Stock removed per pass:		
Roughing cut	0.003 in.–0.004 in.	0.006 in.–0.009 in.
Finishing cut	0.001 in.–0.002 in.	0.001 in.–0.002 in.
Total wheel wear per piece ground	0.018 in.–0.025 in.	0.004 in.–0.011 in.
Wheel life	8–14 days	21-24 days
Wheel life average	11 days	22½ days
Gain in average	....	105 per cent
Wheel size	8 in. x ¾ in. wide	8 in. x ¾ in. wide
Grit size	3846-J-5-B	3846-J-5-B

It will be seen that the performance figures recorded in Table I, Column 2, are more favorable than the corresponding figures given in Column 1. The differences must be due to the condition of the metal surfaces at the beginning of the job, since the other factors influencing the results are the same in both cases. The salient economies disclosed, when the electrolytic method of descaling is used are these:

First, the saving in time is 48 per cent. This means a corresponding saving in direct labor cost and its proportional saving in shop overhead cost.

Second, the number of roughing cuts required to remove the metal to within average limits for finishing is reduced because the metal is free from scale, and the wheel does not become loaded or glazed when grinding. Therefore, grinding with a clean sharp wheel of grain and grade suitable for the metal being ground will give maximum results by reducing the amount of heat generated by the wheel, which is a direct cause of distortion and surface cracks. These facts are more evident when attention is called to the depth of the finishing cuts, which remain the same regardless of the precleaning method, because it is obvious that the metal is then scale free.

Third, the average life of the grinding wheel is more



The part at the right is not an exceptional example of heat scale

than doubled because the wheel does not load and glaze. Wheel dressings are less frequently required.

Internal Grinding
Table II

Operation: To finish grind a 2-in. hole.

	Scratch brush	Bullard-Dunn
Method of descaling		
Condition of surface before grinding	Not clean	Entirely clean
Time per piece	6¾ min.	4½ min.
Per cent time saving	...	33⅓
Wheel life	5 hr.	8 hr.
Gain in wheel life	...	60 per cent
Wheel size	1¾ in. x 1 in. wide	1¾ in. x 1 in. wide

In this operation the following facts are noteworthy.

First, the saving in time is 33⅓ per cent.

Second, the wheel life is increased by 60 per cent.

The elimination of "bell mouthing" or grinding out of round, due to the differences in the cut of the wheel on clean metal as compared with the cut on a surface spotted with scale, is responsible for a reduction in spoilage when the precleaning method indicated in Table II, Column 2 is used.

Gear Grinding
Table III

Operation: Grind hole

	Scratch brush		Bullard-Dunn		
Method of descaling					
Condition of surface before grinding	Not clean		Entirely clean		
Piece	Method of Holding	Time in Min.	Method of Holding	Time in Min.	Per Cent Time Saved
Bevel pinion pc. No. 14400	Singly	6.75	Singly	4.50	33⅓
Sliding clutch pc. No. 12503	Singly	8.50	Singly	7.00	17
37 T gear pc. No. 8639	Singly	15.00	Singly	12.00	20
Change gear pc. No. 9505	Singly	15.0	Singly	8.0	46
Chuck pinion collar pc. No. 1576	Singly	3.0	6-ganged	1.2	93
Collar pc. No. 1577	Singly	3.0	6-ganged	.5	91

This operation is another class of internal grinding. The time savings confirm the data in Table II.

Two things should be noted:

First, a considerable part of the time saved is due to the ease and certainty of chucking scale-free gears for this operation, with their pitch lines as a reference.

Second, scale-free gears can be ground in gang fixtures; those not absolutely clean cannot because of the impossibility of uniform location in a fixture when any surface scale is present.

Rack Grinding
Table IV

Method of descaling		Scratch brush	Bullard-Dunn
Condition of surface before grinding		Not clean	Entirely clean
Piece	Surfaces to be Ground	Time in Min.	Time in Min.	Per Cent Time Saved
Feed rack pc. No. 10212	5	36	30	16
Horizontal rack pc. No. 10295	2	45	37	17
Vertical slide rack pc. No. 50603	3	54	28	48
Vertical slide rack pc. No. 13762	3	2.6	1.45	44
Feed rack pc. No. 10388-1	All	2.0	1.42	29

In rack grinding the time savings shown result partly from the gains in the speed of accurate location of the rack in the grinding fixture and partly from the lack of necessity of frequent micrometer readings to check and correct the tendency of the rack to warp during the grinding. Further savings are a direct result of the use of faster cutting speeds and heavier cuts. These reductions in time are accomplished without sacrificing accuracy. The percentage of spoilage has been reduced as the result of thorough precleaning.

Jig and Fixture Grinding
Table V

Method of descaling		Scratch brush	Bullard-Dunn	
Condition of surface before grinding		Not clean	Entirely clean	
	Time in	Time in	Per Cent Time	Per Cent Spoilage	
Piece	Min.	Min.	Saved	Col. 1	Col. 2
Yoke shoe stype 143	3	2.5	16⅔	20	Less than 1

Table V shows, in addition to a saving of 16⅔ per cent in production time, a reduction in percentage of spoilage from 20 per cent average to an average of less than 1 per cent. The reason for this marked reduction in spoilage is that these particular pieces are located at two or more points, being held in the grinding fixture by the shank of the pieces while the sides and fillets are ground true and central. The necessity of using what might be termed "compound locating points" very much increases the value of complete descaling prior to grinding because otherwise "compound location" becomes much more difficult and in some instances almost a practical impossibility.

Cylindrical Grinding—Stud Location
Table VI

Operation: Clutch shaft lever plunger, pc. No. 4970-2

Method of descaling	Scratch brush	Bullard-Dunn
Condition of surface before grinding	Not clean	Entirely clean
Time per piece, min.	5½	4½
Per cent time saving	..	18
Per cent spoilage	12	Less than 1

The gains shown in Table VI result from the fact that this particular part is located by means of a blind hole and, therefore, accurate location is necessary if the piece is to be accurate when finished.

We have found to our profit that the cost differences between grinding a metal surface which has been freed from scale and ont which has not are great.

An American Toolmaker in Russia

WALTER WELLS

Summer residence twenty miles from Moscow, romantic but not too convenient. Some Americans prefer the pines and birches and the nearby lake to the city. This cottage is built of logs, faced off on the inside

HAVING had the interesting experience of working as a tool and diemaker in the faraway land of Soviet Russia, I am glad to give a brief account of my sojourn in that country so that the readers of *American Machinist* may be enabled to get a first-hand view of how conditions really are there particularly working and living conditions as they pertain to our trade.

The writer entered into a contract with one of the extensive state trusts called, "Orga-metall," for the term of one year beginning in the month of May, 1930. The terms specified that I was to be located with a branch of this trust called "Prisposoblenie" which has its factory in Moscow. This word is a corker, and I had my troubles trying to tell people where I worked. But, seriously, it simply means "an adapter," that is, a jig or fixture, though the term also includes dies and tools.

My remuneration was extremely liberal, being expressed in enough Soviet coin to live comfortably on the best that the country had to offer, while, at the same time, the authorities were depositing to my credit in an American bank, an amount very nearly approaching the current rate for diemakers in the States. All the traveling expenses for Mrs. Wells and myself were fully paid in tourist class accommodations. Upon arriving in Moscow, the factory administration extended their good offices in locating an apartment for us immediately.

As can well be imagined, I had a tough nut to crack in the Russian language. Its grammar is very difficult. The best way to learn the language, especially for an American, is by experience. Illustrative of that, I can relate my first experience in a Russian restaurant. Feeling in a mood to eat a nice steak, I began to wig-wag in the sign language what I thought would indicate a T-bone steak. "Ach, bif-steks" interpreted the waiter. That is the Russian word for our beef-steak and you can believe it was not hard to remember. That same day, while riding on the street railway, I accidentally trod on some poor fellow's toe. Instinctively I knew that I had to say something polite, appropriate to the occasion. With all confidence that I was correct, I said, "spasiba." The Russian turned upon me in utter surprise, which action was made clear to me later when I learned that I had said, "thank you"!

It appears to me that the main thing, when going to a foreign country to work, is to get an accurate idea of how conditions are there before setting foot aboard ship in New York. I was extremely fortunate, because of minute advice given by an engineer acquaintance who, having just returned, knew Russian conditions thoroughly.

Having been given his practical advice, I can truly say that I encountered no major difficulties during my stay in Moscow, though there are some Americans who came to Russia inadequately prepared to meet typical conditions and problems. The questions of Winter clothing, and complete tool kits, with all measuring tools in the metric scale, must be settled before leaving New York. Toolmakers should have a good idea of what is meant by single angle projection drawings. Then it is always better for all parties concerned that a *definite* understanding be made about getting a suitable apartment in Moscow.

My introduction into the factory was a pleasant surprise. I expected to find strange uncouth machinery of ancient vintage. Instead, I saw the very latest in American machine tools—rows of milling machines and other machine tools of the most approved design. There were sprinklings of German machines, millers, lathes and shapers, but the operators informed me that they were not liked so well as the American makes, chiefly because

Immediately after his return to the States, we asked Mr. Wells to write down his impressions of U. S. S. R. while they were fresh and warm in his memory. His contribution, prepared for *American Machinist* exclusively, rounds out a notable series on the Russian experiment

▼

they worked rather stiffly on the ways and were not so sturdily built.

This factory is really a super-job-shop, it being supposed to set the example for all Russian factories to follow. Dies and jigs are built there for all the great Soviet plants in operation today, and the output compares favorably with American standards. Limits range from 0.0001 in. on gages, 0.002 in. on dies and jigs of the first grade, and 0.004 in. on the rougher type of fixtures, dies and oil-hole jigs.

It takes a little time for one to adapt himself to the metric system. Of course the system as such is very simple, but the troubles arise in making the translation from English standards. For instance, the micrometers and verniers have varying graduations, some based upon the millimeter and some upon the half-millimeter, tending to cause errors in reading until one becomes thoroughly familiar.

The single angle projection, otherwise known as first angle drawings, formerly used in England, is the prevailing mechanical drawing in both Germany and Russia today. This method is rather hard for an American to accustom himself to. I found it pretty annoying, chiefly because the views are laid out inversely to the well known American method. This difficulty persisted quite a while after I had mastered the Russian inscriptions and specifications on the prints. But all such difficulties straighten themselves out after a while. After a year's time, even the language did not seem so formidable. I am considered to be a poor linguist, but I checked up long lists of items sent from the hardening

The famous "demonstration warehouse," Moscow, where passersby can see American and German machine tools in operation. Note the sign — ORGA-METALL—in English characters for the one purpose of attracting Americans. It means "organization of the metal industry"

room, all noted down in Russian handwriting, possibly the most difficult of all to decipher!

The Russian mechanics, both young men and girls, look upon machines and tools in a way almost romantic. It is all so new to the majority of them. One of the girls had read somewhere of bevel gears and asked to be shown what they looked like. Upon being shown, she exclaimed in perfect English—"Oh, how beautiful, I just adore bevel gears!" This would seem to be quite in contrast to the attitude of our American apprentice boys.

The factory where I was located worked the legal eight-hour day. On the rare occasions when it was

Apartment building in Moscow. The apartments themselves are steam-heated and wired for 120-v. electricity. An American intending to sign a Russian contract should insist on terms insuring him similar accommodations

necessary to work overtime, the rate was time and a half for the first two hours and double time for the last two. Twelve hours is the total maximum allowed. The conditions of work are good. Though they have estimates on all work in the toolroom, we Americans had no difficulty in keeping within the liberal time limits.

As a rule the shop sanitary conditions were well attended to. Whatever shortcoming there was is rapidly being eliminated—simply a matter of proper adjustment. For instance, the Moscow drinking water, while it seems all right to the natives, does not act kindly to Americans. So they proceeded to boil and cool water for us when the difficulty was made clear. First-aid treatment in case of minor injuries in the shop is somewhat crude, and to be on the safe side, it is best to bring along a complete first-aid kit. I fortunately encountered neither accidents nor sickness during the year abroad; but several other Americans were compelled to avail themselves of the benefits offered by the Soviet government, and they speak highly of the service rendered. There is a special medical service without charge for foreigners, full pay being given during the period of absence from work.

The factory administration, as a whole, was courteous to me. There was friction at times, like there is in any shop—a difference of opinion as to how a job should be done, or a misunderstanding of certain rules, would precipitate an argument. But, without exception, these matters would be ironed out after proper explanation. Some Americans think that they know everything that there is to be known and that the Russians are only blacksmiths. Personally, I have the very highest respect for the native Russian toolmaker. Without the help of all those fine tools that we have in the States, they were making first class progressive dies, drawing dies and drill jigs, years before Americans came to Russia. I refer to the experienced Russians, of course.

On the other hand, I can express some constructive criticism to the effect that the Russian engineers, a few of them, seem to think that when we express our opinion that a particular American method is superior to that which they are using, we are implying that we, as individuals, are superior to them. However, the majority of the Russian engineers and mechanics are too intelligent to fall into this unfortunate error.

My work at first consisted of making dies and jigs at the bench, most of the machining being done by specialists at the machines. I had a few young mechanics work-

ing with me to learn the trade. They progressed very well, considering that I began with the sign language. They have a special school where they learn how to file and do other hand work. After about three years, training they turn out complete dies and jigs. It is really remarkable. The other Americans also found the Russian toolmakers easy to get along with. Though we foreigners received higher pay as a rule than the Russian mechanics of equal qualifications, yet they never displayed any jealousy toward us as one might expect. They know, instinctively, that all this arrangement will before long redound to their benefit.

Toward the latter part of my term, I was transferred to the inspection room. This department needed a lot of jacking up because there was a tendency on the part of some of the less experienced men to allow indifferent work to slide through. Some of the dies came back from the presses because the parts stamped out were not readily inter-changeable. I immediately held the toolmakers to the permissible limits, and the work began to come into our department in first class shape. I found it very interesting to see how they took pains to keep the work up to the mark. The Russian workman is very enthusiastic about his work; he will take a lot of beating until he gets the hang of the thing and hits his stride.

I was somewhat more fortunate than some others in obtaining a summer cottage twenty miles from Moscow for the summer and fall months. The surroundings were beautiful, including a lake for swimming. When the snow began to fall in earnest, I moved into the city to an apartment that I had applied for months in advance. It is true that apartments are very hard to get in Moscow, but they *can* be obtained if the stipulation is *precise* in the contract. I was fortunate in that I came in the spring, and my application for a room had five months to be acted upon.

The cottage was a log cabin affair, with the logs faced off on the inside. I commuted on a ramshackle old railroad which took about 50 minutes for the trip. Some of the other men lived out on the electric line, which is very modern and fast, comparing favorably with the Underground in London and surpassing some of the subways in New York.

The apartment we had in the city was steam-heated and supplied with 120-v. electricity. There was bath and janitor service.

No Pie in Russia

As for food supplies, we Americans generally preferred to cook our own. There is a general store, or "magazine" as it is called in Russian, at which foreigners under working contracts only are allowed to purchase their supplies. There are beef and pork, the finest of boiled ham and smoked sturgeon, and dairy products. One can stock up on the simple food like bread and potatoes or walk across the aisle and get the most delicate of viands, fine wines and confections. The restaurants of the better class are very high in price, that is, too high to eat in them regularly; but we all patronized them from time to time. The cooking in these restaurants is, of course, Russian style. At this point I would like to warn all Americans that there is no equivalent for pie in Russia. Some of the American women were forever promising to remedy this shortcoming, but it seems that they forgot to bring their pie plates along with them! Anyhow, we Americans haven't any of that good Caucasian wine here, so we are even.

As for enjoyment during leisure hours, it all depends upon the individual. I personally like the Russian music at the opera, which I attended once a week. Then there are art galleries, one of which is world famous. We made use of the International Library, which has a splendid English collection. The movies are not so attractive to Americans, because of the Russian script in the sub-titles. But occasionally we were "tipped off" about pictures that could be understood without reading the titles, and we would enjoy them. They are modernistic. There are the Russian vaudevilles, called circuses, where one can have a lot of amusement. One can see Russian cowboys in action, and were it not for the difference in dress, one would think that it was a rodeo.

This should be enough to choose from to while away the time during the long Winter. When Summer comes, there is no need to tell the Americans what to do for sport. They play soccer over there, and there are rivers and lakes and parks. Now if one would not forget to bring the old bus along, there is the country to explore. We all received two weeks vacation with full pay. I preferred to remain near Moscow. The others journeyed to the Crimean peninsula for salt water bathing.

Entering and Leaving

Many questions have been asked me about the facility of entering and leaving Russia. I would like to state that my American passport, which was stamped with the Russian visa in London, sufficed for the entry across the border. There was no hindrance in that respect. I had some annoyance with my luggage, and it is always advisable to pack luggage with two ends in view: first to safeguard against crushing; and second, to permit easy inspection at the border lines. In Russia they make a pretty thorough search, but if everything is above board there will be no trouble. I was shortsighted enough to wrap all my measuring tools individually.

In leaving the country the same conditions prevail. Upon five days' notice the permit to stay is withdrawn from the passport. I was free to leave at any time, as the withdrawal of the permit is a mere formality. It is good policy when travelling in Europe to use regular traveller's checks for all incidentals. Denominations down to $10 are most convenient. These checks facilitate exchange difficulties, as they are recognized everywhere. As I mentioned before, trouble crops in only when the traveller is not sufficiently advised as to procedures in foreign countries—just like the American who bought a railroad ticket and threw it away when the conductor "forgot" to collect the same en route. At the terminal he discovered that it was a pay-as-you-leave arrangement—and then there was an argument!

One may ask, why I left the country at the expiration of my contract. That is not so hard to answer, because in my case it had nothing directly to do with conditions, either there or in the States. It was strictly a personal matter. Under the same conditions I would return.

However, many are staying over for new terms. They say quite frankly that they are beginning to like the conditions of work over there. Just at present they would not come back for the simple reason that their relatives inform them that there are no jobs to be had over here. Offhand, I believe that there is a future in Russia both from the viewpoint of a mechanic going there to work and from that of a manufacturer of machines and tools. The American machines rank first over there, and there is no second.

Making and Keeping Crankpins Square

FRED H. COLVIN
Editor

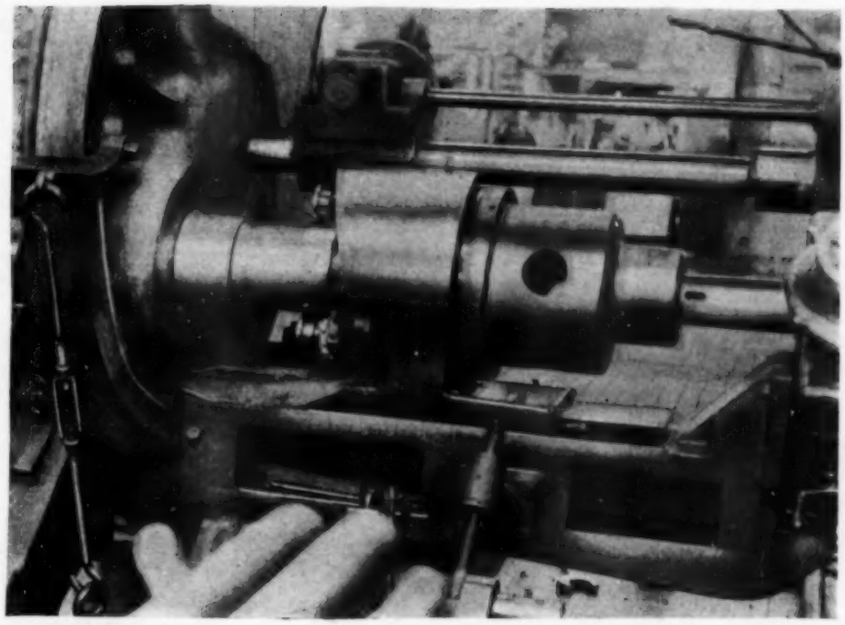


Fig. 1—Rolls are fitted to the turning head in place of cutters and fed over the pin similarly

CRANKPIN alignment has long been a problem in railway shops. Few of the present-day shop men remember when worn pins were rounded up and brought into line by an old-time machinist with a file, the final finish being done by drawfiling. Although this method is now only a memory, crankpins are still a serious problem.

Main crankpins naturally give the most trouble, due both to the overhang from the wheel center and to the heavy pressures applied in alternate directions. When a pin extends 20 in. from the wheel it takes only a small error at the wheel to make an appreciable variation at the outer end. A number of railway executives who are responsible for maintaining motive power have given us an outline of their experiences along this line. The information has been condensed as follows:

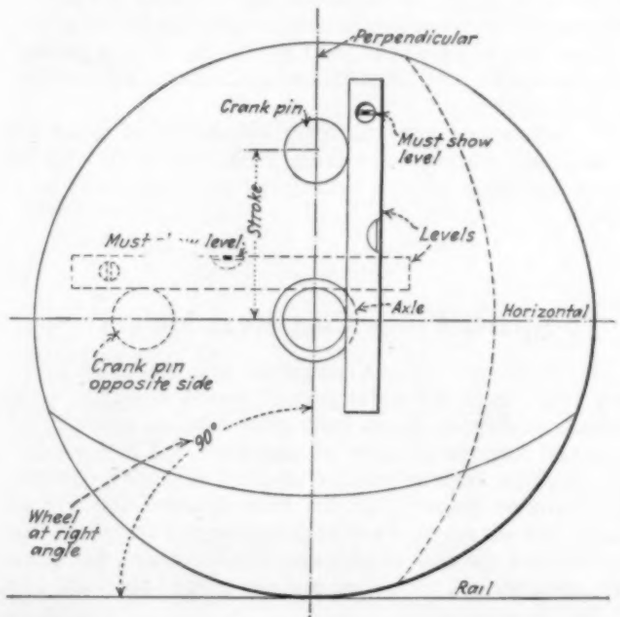


Fig. 2—To check for quarter, scribe on centers of axle circles equal to diameter of crank pins. Place a level perpendicular with edges of crankpin and circle scribed on axle. Do the same on opposite wheel, with level horizontal. If both levels check the quartering is correct

R.R. No. 1—"We have few complaints that crankpins are out-of-square. We use a well-known single-ended crankpin boring machine or pin turning machine. After one hole or pin is finished the wheels and axle are turned around for working on the other end. We use V-blocks, surface gages and other special tools for determining the exact location. The machine is not equipped for grinding pins."

R.R. No. 2—"Round house checking of pin alignment is done by placing a straight edge across wheel centers when tires are removed and using a square and calipers in several different positions. A more accurate way is to place drivers on a large faceplate (surface plate) equipped with parallel bars. A surface gage checks alignment of pin. Wheels are turned in different positions to check at different points."

R.R. No. 3—"Pins are left with a finishing allowance and after being pressed in place they are turned in the quartering machine, leaving a small amount for rolling. The rolling rolls are fitted to the turning head in place of the cutters and fed over the pin, as in Fig. 1.

"After rolling, the pins are checked for accuracy, as

shown in Fig. 2. A circle of crankpin diameters is scribed in the end of the axle as in R.R. No. 8, but an accurate level replaces the plumb bob and line. When one side shows level the other side is checked in the same way except that in one the level is vertical and in the other horizontal."

R.R. No. 4—"Two locomotives came to us with too long a stroke. We had to pull the main pins, rebore the crankpin hole and put in a new pin. We have had no trouble with pins out-of-square, but we are very careful not to permit lost motion in our quartering machine and to check it frequently as to alignment."

R.R. No. 5—"We have trouble with main pins being out-of-square, and it hardly seems possible to avoid cocking in pressing into the wheel centers, owing to the length of modern main pins. We have no trouble with side rod pins but usualy true up main pins in the quartering machine after pressing into place."

R.R. No. 6—"We know of no completely satisfactory remedy for crankpin misalignment. Long crankpins, distortion of wheel centers caused by shrinking of tires, and the difficulty of maintaining exact alignment in wheel presses all add to the problem. Numerous methods have been tried and expensive machinery bought to cure the trouble but without complete success. When crankpins are worn more than half of the permissible wear limit we pull the pins, and all wheels are quartered. No wheels are quartered or pins pressed in place until tires have been shrunk on."

R.R. No. 7—"We have tried leaving crankpins $\frac{1}{8}$ in. large and finish turning them after they were pressed into place. This method has reduced the out-of-alignment troubles, the greatest variation in such cases now being $\frac{1}{64}$ in. All crankpin holes in wheel centers are rebored in the quartering machine before pressing in new pins."

R.R. No. 8—"We had trouble from crankpins being out-of-square but cured it by buying a new quartering machine in which two pin holes can be bored at once or two pins turned or rolled simultaneously. We turn, or true up, crankpins in driving wheels, in sets, all driving wheels from a locomotive going on the machine consecutively while the machine is set to the stroke for that class of locomotive. The machine is checked periodically for alignment and accuracy. No portable pin turners are used in round houses, all wheels being sent to the main shop for crankpin work."

R.R. No. 9—"Driving wheels in which the crankpins have been trued up are taken periodicaly for a complete checkup. The mounted wheels are placed on wooden horses on which are adjustable straight edges. A circle of the same diameter as the crankpin is scribed on each end of the axle and a hanger placed over the right crankpin, on which weights are placed. A plumb line is thrown over the left crankpin. The hanger on the right crankpin is weighted until the plumb lines on the left crankpin coincide with the circle scribed on the end of the axle."

R.R. No. 10—"A long, accurate level is placed on the right crankpin which is in a horizontal position, while the other end is held to the top line of the circle on the axle end. If the bubble shows in the exact center the pins are at right angles."

R.R. No. 11—"We check the slides of the quartering machine for alignment every week but we find that the pins cock when being pressed into the wheel. So we leave the rod fit $\frac{1}{8}$ in. large and finish turn pins in the quartering machine, rolling them after they have been turned."

R.R. No. 12—"The use of the floating-bushing type of main rod bearings makes it more important than ever to have crankpins parallel with the axle. We have a machine for grinding crankpins in place which gives very good results. We check our quartering machines very carefully at frequent intervals."

R.R. No. 13—"While we bore the crankpin holes as straight as possible we turn the crankpin press fits 0.005 in. continuous taper in the length of the wheel fit. This taper on the pin fit prevents any cocking of the pin as it is forced into place and also prevents tearing the surfaces of the fit during the pressing operation."

Such a variety of experience cannot fail to interest railway shop men in all sections. We shall be glad to hear of other solutions of the problem as it affects economical operation of motive power.

$16,000 a Year from Ashes

Savings of approximately $16,000 a year are realized from salvaging metals from ashes produced in the scrap incinerator at the Schenectady plant, General Electric Co. The ashes, instead of being loaded into a dump car and delivered to the dump, are first run through a ball mill, where they are pulverized, the larger pieces of metal passing out of the mill and over a magnetic separator, which separates the magnetic scrap from the non-magnetic material, consisting of copper, brass, aluminum, etc.

The finer material, which is discharged from the ball mill, passes over an inclined, longitudinally grooved "concentrating table," which has a stream of water flowing crosswise of the material. The metal being heavier than the ash, slides down the bottoms of the grooves and falls off the lower end of the table, while the ash is washed off the side of the table and is then pumped through a "dewatering cone" which discharges the dewatered ash in a dump car. The ash is used for filling in low ground and the metals and concentrates are sent to the smelter or sold as scrap.

By this method approximately 100,000 lb. of ashes are ground and washed, and from 20,000 to 25,000 lb. of metals and high-grade smelting material recovered each month.

Spark Plugs Cost Real Money

Motorists have almost forgotten that changing spark plugs used to be a regular part of almost any tour. But airplane transport planes keep close tabs on spark plugs as a real item in expense of operation. The reason is that airplane engines operate at from 80 to 85 per cent of maximum power, and the heat shortens the life of plugs. By extremely careful selection, one transport line has reduced the cost of plugs to 4/10 of a cent per plane mile, this being a trifle over one per cent of the total cost of the plane operation.

Ideas from PRACTICAL MEN

Checking the Angle of Helical Gear Teeth—*Discussion*

OSCAR F. JOHNSON

Three discussions under this title appeared recently (*AM*—Vol. 75, page 351). In the first U. Seth Eberhardt described a method of measuring from one tooth to another along the axis of the gear. This seems simple, but the accuracy of the results is questionable.

In the second discussion, George Belbes, replying to Francis W. Shaw (*AM*—Vol. 75, page 27) makes several statements that tax the imagination. The ball device he describes, having a round rod lying between two adjacent teeth, will not do the trick even though it is selected to touch the upper half of the teeth so that points of contact will subtend an angle of 90 deg. on the rod. Since the helix angle varies from the root to the point of the tooth, I cannot agree with Mr. Belbes' conclusion that "although it may be desirable that the rod lay along the pitch line, it is not essential that it do so." And after stating that "a straight line or a set of straight lines cannot coincide with a helix," how can he still assume that he is obtaining an angle corresponding to the helix angle?

I should like to know what kind of gears Mr. Belbes has been checking, because in regular helical gears, a rod will not contact both ends simultaneously not even with a gear having an "appreciable" lead. I tried it on a gear with O.D. 16 in., P.D. 15.000 in., 22 teeth, helix angle 8 deg. 15 min., and lead 325.015 in. When a lead of 325 in. does not give the result claimed for the device, I question its value.

I suggest that two more balls be added to Mr. Belbes' device so it may be used to check the helix angles of gears whether they have a long or a short lead. The device is altered so only one of the end balls is fixed, the other three being removable and adjustable. Having obtained two balls g of suitable diameter, the gear with the device in place is first set up as shown in Fig. 1 so the distances Y and Y_1 are equal. After marking center line O-O_1 the gear is rotated 90 deg. to the position shown in Fig. 2. Measurements a and b are taken, and from these, the helix angle ϕ is computed as follows:

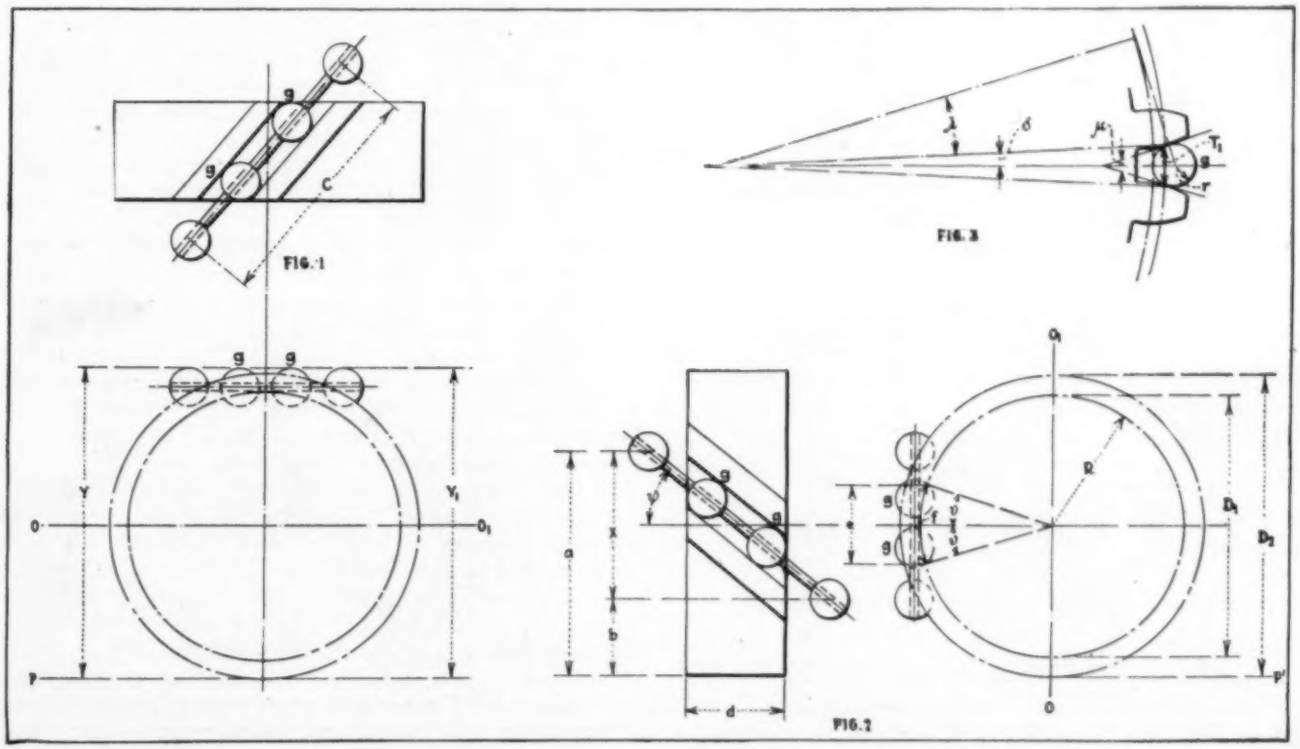
$$T = D_1 \sin \frac{90}{N} \cos \phi \qquad (1)$$

$$T_1 = T + t \qquad (2)$$

$$d_1 = 2r \qquad (3)$$

$$d_1 = \frac{T_1}{\cos \frac{\mu}{2}} \quad \text{or} \quad \frac{T_1}{\cos (\lambda + \delta)} \qquad (4)$$

$$\sin \psi = \frac{x}{c} \qquad (5)$$



$$\sin v = \frac{c}{D_1} \quad (6)$$

$$f = \frac{n^\circ \pi D_1}{360} = \frac{n' \pi D_1}{21600} = \frac{n'' \pi D_1}{129600} \quad (7)$$

$$\tan \phi = \frac{f}{d} \quad (8)$$

$$e = d \tan \psi \quad (9)$$

Where:

c = any convenient length
$y = y_1$ (these must be equal to get the rod in position parallel to the plane $P - P_1$)
T = chorded thickness of tooth at the pitch line
T_1 = chordal width of tooth space at the pitch line
λ = pressure angle of involute
$\mu = 2(\lambda + \delta)$
δ = half of the angle subtended by the chord T_1
r = radius of the balls g
d_1 = diameter of the balls g
d = width of face
t = clearance in thousandths of an inch
e = chord subtending arc f
v = half of the angle subtended by arc f
R = pitch radius of the gear
D_1 = pitch diameter of the gear
D_2 = outside diameter of the gear
$x = a - b$
ψ = projection of helix angle ϕ
ϕ = helix angle
N = number of teeth in gear
n° = degrees in arc f
n' = minutes in arc f
n'' = seconds in arc f
f = arc subtended by chord e

Example: A helical gear has the following dimensions: O.D. 13.9821 in., P.D. 13.5049 in., width of face 4 in., normal circular pitch 0.750 in., addendum 0.2387 in., 40 teeth, 14½ deg. involute, and 45 deg. helix angle.

To find the diameter of the balls g, the value of T_1 must be determined. From Formula 1:

$$T = D_1 \sin \frac{90^\circ}{N} \cos \phi = D_1 \left(\sin \frac{90}{40} \right) \cos 45$$

$$= 13.5047 \times \sin 2^\circ 15' \times \cos 45^\circ = 0.3749 \text{ in.}$$

From Formula 2:

$$T_1 = 0.3749 + t$$

since t is 1 per cent of the normal circular pitch:

$$t = 0.01 \times 0.750 = 0.0075 \text{ in.}$$

and $T_1 = 0.3749 + 0.0075 = 0.3824$ in.

From Formula 4:

$$d_1 = \frac{0.3824}{\cos (14^\circ 30' + 2^\circ 15')} = 0.3993 \text{ in.}$$

Let $c = 7$ in.; a measures 9.4477 and b, 4.5344 in.

Then $x = 4.93133$ in.

From Formula 5:

$$\sin \psi = \frac{4.9133}{7.0000} = 0.7079 = \sin 44^\circ 34' 47''$$

$$e = 4 \times \tan 44^\circ 34' 47'' = 3.9418$$

From Formula 6:

$$\sin v = \frac{3.9418}{13.5047} = 0.2919 = \sin 16^\circ 58' 14''$$

Therefore:

$2v = 33^\circ 56' 28''$ = angular value of arc f
$= 122188''$

From Formula 7:

$$f = \frac{122188 \times \pi \times 13.5047}{1296000} = 4 \text{ in.}$$

Therefore from Formula 8:

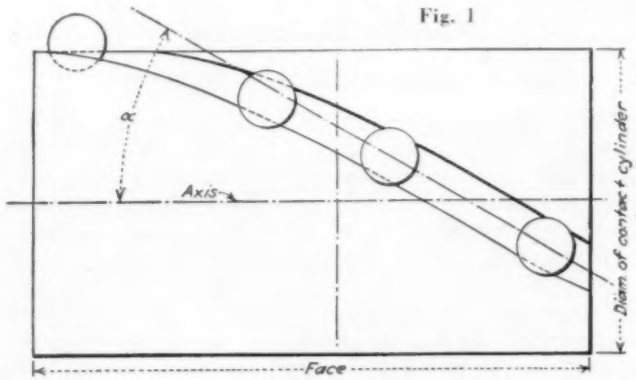
$\tan \phi = \frac{4}{4} = 1 = \tan 45$ deg. which proves that the real helix angle has been determined.

FRANCIS W. SHAW
Gear Consultant, Heywood, England

On reading the comments on my contribution to this discussion, I feel that they do not say the last word on this "twisted" subject. The diversity of findings is possibly caused by some misconception as to the real shape of involute helical teeth.

George Belbes still insists that the two-ball rod method is practical—that the parallel part of the rod will lie between two teeth and not rock. Now, I have just endeavored to get a $\frac{9}{32}$-in. rod to lie steadily between the teeth of a 14-tooth helical gear generated by the Sykes system, its pitch diameter being about $2\frac{1}{8}$ in., its helix angle 30 deg. This rod makes contact near the tooth crests but not on the points. Both this and a $\frac{5}{32}$-in. rod rock as on a cylinder. If the toolmakers, Mr. Belbes mentions, find the device both practicable and adaptable, I shall have to attribute the rock to some defect in the gear.

Fig. 1



Charles Kugler mentions that he failed in endeavoring to gage the helix angle from two balls laid between two adjacent or separated teeth at their ends. Why he failed, Fig. 1 will reveal. Angle α varies according to the position of the gaging balls.

Later Mr. Kugler falls back upon the familiar method of rolling the gear, with a tooth blackened, upon a piece of paper, so getting the outer helix angle, from which he can then calculate the pitch helix angle. He knows of no better method and demands a better if such exists.

One answer he will get from the contribution of U. Seth Eberhardt on the same page. From Fig. 2 herewith he will get another, along with a view of a little known feature of every involute helical gear.

In this drawing, we have taken a somewhat exaggerated gear and removed by a plane cut all the portion of the teeth down to the base cylinder. In doing this, we have brought to light that tangential to the base cylinder there is a pair of straight lines extending from the base to the crest of each tooth. Along the axis, the lines upon the same side of each tooth are separated to the extent of the linear pitch, a feature of value for checking the pitch accuracy of wide-faced gears such as turbine gears. If the reader will inspect any helical gear, in which the

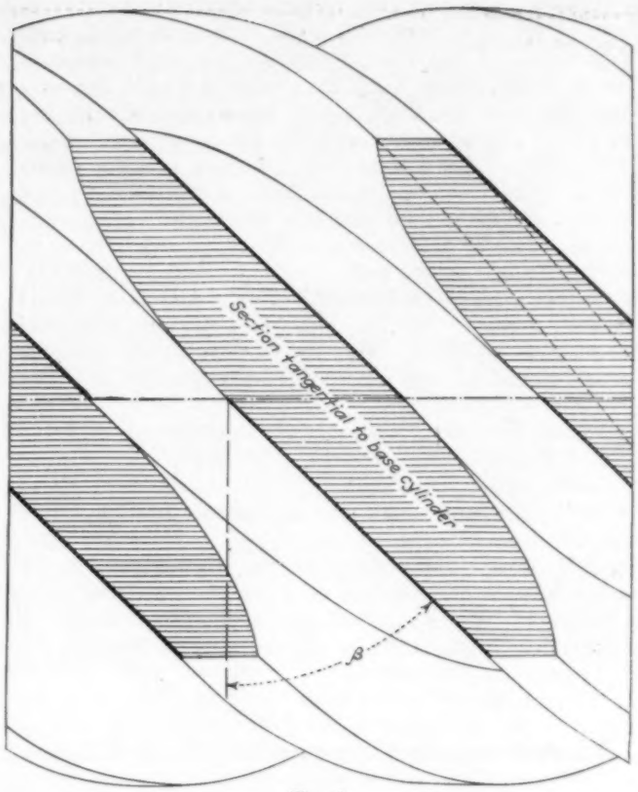


Fig. 2

base cylinder is within the teeth, he will see these lines. If the base cylinder is below the root cylinder, he will still see straight lines, but these will extend only from the points at which the tangential plane breaks through the root cylinder.

To those engaged in grinding or are desirous of grinding the teeth of helical gears, a knowledge of the presence of these lines may indicate a method different from those in vogue, if it is realized that these lines are the most prominent portions of the teeth. Therefore, the side of an abrasive wheel, the side being at right-angles to the axis, can be presented to the lines, covering every point in the helicoidal surfaces right from the base cylinder to the crest cylinder. All that is necessary to do to generate the involute is to screw the gear endwise at a velocity of one turn for one lead length. A saucer-shaped wheel has been successfully employed, the rim of the saucer being wide enough to contain the straight line.

That this system is thoroughly practical, the writer is well aware, for employing an ordinary worm grinding machine, he succeeded in rectifying a number of 30-tooth helical gears of about 8-diametral normal pitch that had badly distorted in hardening.

Let those engaged in checking helical gears look out for the straight line and measure the angle it presents to the axis. This angle is the angle of the base helix. The angle at the pitch helix is then determinable by the formula:

$$\tan \alpha = \frac{\tan \beta \times A}{B}$$

where: α = Pitch helix angle
β = Base helix angle
A = Pitch diameter
B = Base diameter

Or, having found the diameter at which these straight lines exist and measured the angle β the lead may be determined by the following formula, C being the lead, which is the same at every helix:

$$C = \pi B \cot \beta$$

G. D. TAYLOR

The illustration and description of George Belbes' method of checking angles of helical gear teeth did not impress me as a sure and safe way to do the job. Not only did the criticisms of Messrs. Shaw Eberhardt, and Kugler add weight to my objections, but so does Mr. Belbes' own statement when he says (Vol. 75, page 351), "If a rod is large enough so that it does not sink below the upper surface of the gear teeth, and small enough so that it does not rest on the edges of the teeth, such a rod should prove satisfactory," and again, "Although it may be desirable that the rod lay along the pitch line of two adjacent teeth, it is not essential that it do so; it is only necessary that it be arranged to that it will follow the direction of the teeth." To arrange a straight rod to follow the changing direction of a 45-degree angle helical gear tooth or space and indicate the

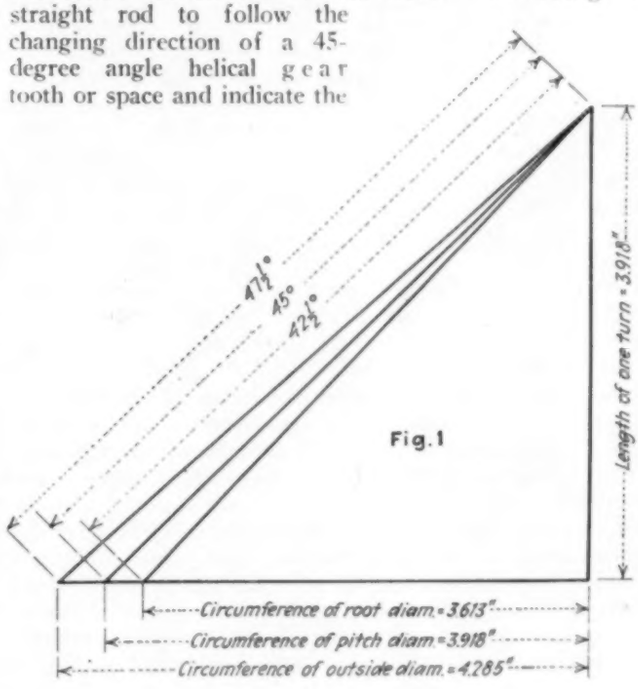


Fig. 1

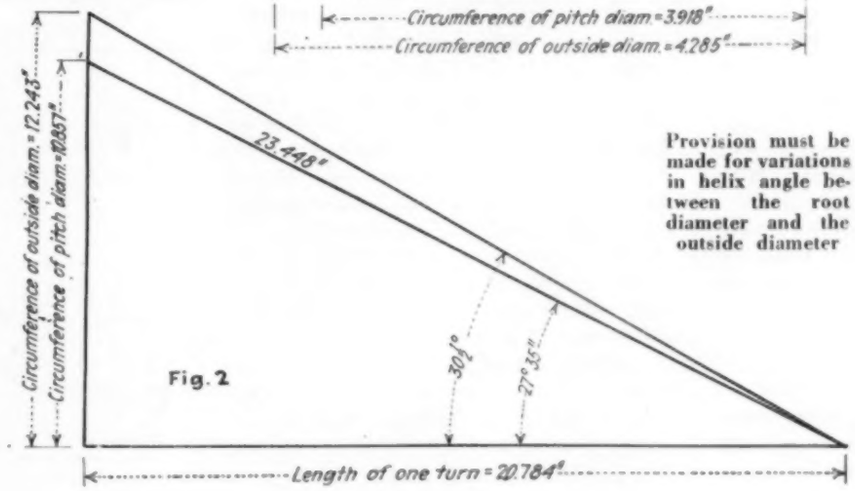


Fig. 2

Provision must be made for variations in helix angle between the root diameter and the outside diameter

correct angle is some problem. The means for obtaining the correct answer is not found in all shops.

Gear teeth to be satisfactory must be cut and assembled correctly; if not, unusual wear is the result. Most, if not all, gears are figured as two pitch circles rolling together. Since this is true, the pitch circle is the proper place to measure the helix angle. To show just what I mean, take a piece of 2-in. diameter or 6.2832 in. in circumference, and set the spiral for 1 turn in 6.2832 in. The helix angle will then be 45 deg. If a gash ½ in. deep is now made, the root diameter will now be 1 inch and the helix angle at the bottom of the gash, instead of being 45 deg. will be 26½ deg. plus. This shows that the helix angle is changing from the top to the bottom of the tooth space, and to get a rod to just touch on the sides of the teeth at the pitch circle with certainty will require not only a good toolmaker but one who knows his trig. Even when the size and location are established, the contacts will be little better than mere points, because of the outline of the tooth combined with the warped surface of the helix.

I have before me two helical gears given me to play with: 17 pitch, 15 teeth, 1 in. face, spiral angle 45 deg., axes at 90 deg., O.D. = 1.364 in., P.D. = 1.247 in., diam. at bottom of space = 1.115 in., outside circumference = 4.285 in., pitch circumference = 3.918 in., root circumference = 3.613 in. As stated, the proper place to measure the helix angle will be at the pitch circle and with a 45 deg. angle, one turn will be 3.918 in., and this length for one turn will be the same at the root or top of tooth. As the root diameter is 0.132 in. less than the pitch diameter, the angle will be 42½ deg. instead of 45 deg. As the O.D. is 0.117 in. greater than the pitch diameter, the angle will be 47½ deg.—a total of 5 deg. difference between top and bottom of the tooth. See Fig. 1.

As the gears were a present, I had to find the pitch. They looked to be about 16 pitch, but as the space was less than 0.135 in. deep, the depth for 16 pitch, and more than 0.120 in. which is for 18 pitch, I had no choice but 17 pitch. 15 teeth divided by 17 = 0.882 in. for the pitch diameter of a spur gear. As the angle was 45 deg., 0.882 × 1.414 = 1.2471 in. Adding 2 ÷ 17 (or 0.1176) = 1.3647 in. for the outside diameter. By measuring over a flexible band passed over the tops of the teeth and subtracting two thicknesses, I obtained the same measure as by calculation. Knowing the pitch diameter, its circumference gave me the length of one turn at 45 deg. angle. Fig. 1 shows how the angles change as the diameter changes. If the space could be cut to the center, the angle would vanish and become a straight line. (*Brown & Sharpe Treatise on Gearing* —page 98.)

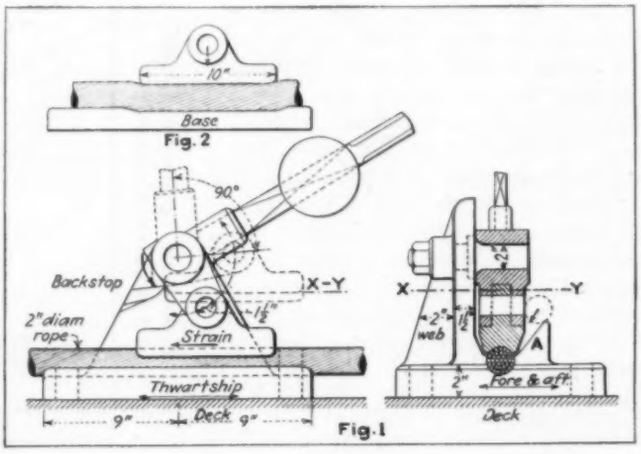
As I understand it, Mr. Eberhardt and Mr. Kugler measure their angles from the tops of the teeth, Mr. Eberhardt standing a square up to measure and 90 per cent of the jobs are right at first trial. Mr. Kugler blacks a tooth and the gear is rolled on a piece of paper, and the angle (of the top of the tooth) is determined by a protractor. Mr. Kugler also adds, "No claim is made that accurate results can be obtained by this method, but it is the best I know of. If any reader knows of a better method, I will be glad to hear from him." For an answer I submit the following: A customer breezes in, slams down a badly worn helical gear, and says, "Make a new one quick" and beats it, leaving me to work out the problem as best I can. This I do as follows: Number of teeth: 26, depth of space, about $\frac{1}{8}\frac{3}{4}$ plus (so near that I call it 8 pitch which cuts 0.270 deep). I am able to measure the O.D. which is close to 3.900. Next I lay the gear down on a flat surface, then wind one thickness of clean paper around the tops of the teeth, making sure that the lower edge of the paper rests on the flat surface. I then rub the paper against the edges of one or two teeth and make a distinct line on the paper, then measure the angle with a protractor, which in this case was 30½ deg. As I wish to know the angle at the pitch circle, I multiply the O.D. circumference (which is 12.243 in.) by the cotangent of 30½ deg. which is 1.6976; this gives me the length of one turn = 20.784 in.; this squared = 431.9746. The circumference of the pitch circle is 10.857 in.; this square = 117.8744; plus 431.9746 = 549.8490; extracting square root = 23.448 in. the length of the hypothenuse of the right angle triangle. (See Fig. 2). To get the sine, divide 10.857 by 23.449 = 0.4630. Find 0.4630 in the sine table, and in the left hand column, read 27 deg. 35 min. for the angle at the pitch line, which I think is the proper place to measure from. Notice there is a difference of 3 deg. between the angle at the top of the teeth and that at the pitch circle, or about 6 deg. from the top of the tooth to the bottom.

An Automatic Gripper for Wire Rope

J. T. TOWLSON
London, England

In the illustration is shown an automatic gripper for wire rope used in docking vessels. With one gripper on the vessel and another on the dock, there is no necessity for taking turns of the rope around the bitts, either on the vessel or on the dock. In Fig. 1 is indicated how the device automatically grips the rope between the base and the gripper shoe, while in Fig. 2 is shown diagrammatically in an exaggerated degree, the positive grip the device takes upon the rope.

In operation, the weighted lever is brought to a position slightly beyond the vertical, raising the pivoted shoe to the line *X-Y*, so that the rope, shown in dotted lines at the top of the abutment *A*, may be easily passed to its seat in the base. The rope having been seated, the weighted lever is "bumped" down and the rope is immediately gripped, the grip increasing as the cam action functions. With this device the rope may be



gripped or released immediately, the slight distortion, as shown in Fig. 2, preventing any possible slippage. For vessels that have to be speedily moored and unmoored, this gripper is recommended.

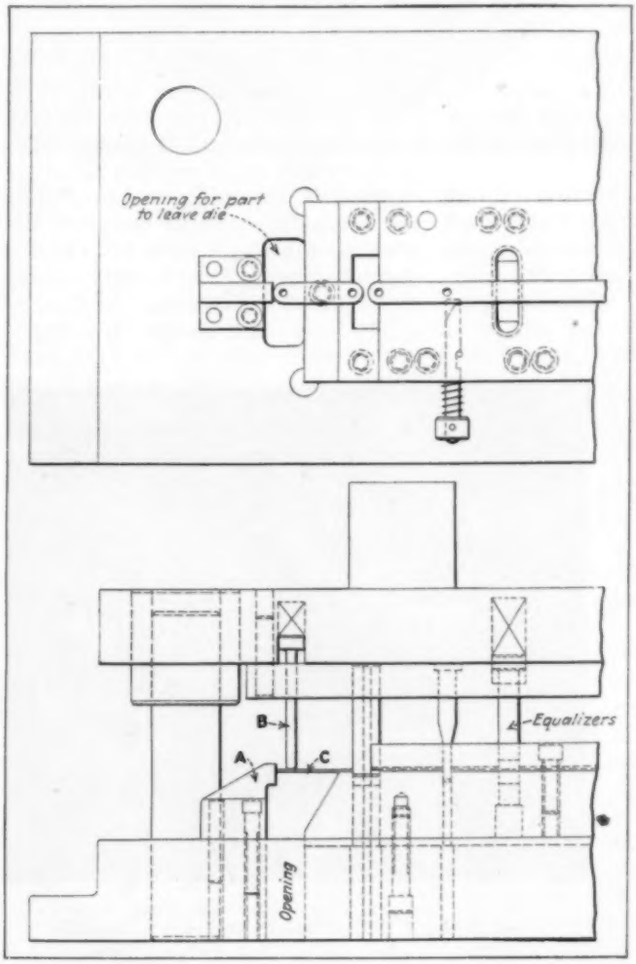
For holding and quickly releasing a rope for other purposes besides vessel work, I have found the device invaluable. Although the illustration shows the device gripping a rope of 2 in. diameter, it is obvious that the principle is adaptable to a larger or smaller diameter.

A Positive Unloading Device

FORREST L. JOHNSON
Westinghouse Electric & Manufacturing Company, Mansfield Plant

One of the essentials, that enter into the correct design and construction of press tools, is the method adopted for unloading or getting rid of the finished piece. This matter is one that should not be considered as a hit or miss proposition.

The piercing and parting tools illustrated were designed with the expectation that the finished parts would fall through a hole in the die, because of their unbalanced condition, the width of the hole being more than half of their length. The operation of these tools became a nursing proposition for the operator. At times, after the pieces had been parted from the strip, their ends would be raised by the upward movement of the parting punch, allowing the oncoming strip to upend them and jam them against the stop *A*, thus holding them and preventing the strip from contacting with the stop.



This trouble was eliminated by the addition of a spring-actuated plunger. As the ram descends, the plunger *B* contacts with the piece *C* before it is parted from the strip, and is held stationary by the compression of the spring as the ram continues its descent. As the piece is parted from the strip, the end over the exit hole is pressed downward by the plunger, causing the piece to upend and drop through the hole before the oncoming strip can interfere with it.

To prevent the plunger from bending the unsupported part of the strip, the spring should be made so that its pressure will be in proper relation to the stiffness of the stock. The relative position of the plunger to that of the parting punch is a factor in the positive ejection of the finished piece.

SEEN AND HEARD

JOHN R. GODFREY

Idle Machines Cost Money

Aircraft lines are having some experiences similar to those of other forms of transportation. They find that the loss of revenue while a plane is laid up for repairs is greater than the cost of the repair job. Being a new industry, they are not handicapped by a lot of antiquated machine equipment as are the railroads in too many cases. And not all railroad executives seem to realize the value of speed in railway repairs. Airplane line operators have to watch costs closely and find that small repairs, such as replacing a worn bushing, increases the possible flying service many hours. Airplane repairs are likely to afford a fair market for machine equipment in the near future.

Oil Consumption and Bearing Clearances

Checking bearing clearances by the amount of oil consumed is a new notion that has been developed by air line maintenance men. On one type of radial airplane engine, the oil consumption is approximately one pint per engine hour when the main bearing clearance is 0.0015 in. If the clearance is permitted to reach 0.005 in. the oil consumption rises to three quarts per hour, due to spill into the crankcase. So this particular line replaces and rebores bearings when the clearance reaches 0.0035 in. or when the crankpin is 0.0005 in. out of round. Cutting oil consumption also cuts operating costs appreciably.

Double Acting Planers

Every so often the plan of cutting both ways on a planer pops up from one source or another. Some feel that the planer would be greatly improved by eliminating the time lost on the return stroke. It isn't a new idea for, as I've said before, I saw the device on what was supposed to be the first planer built in this country, although the tool flopping device may have been added later. A friend tells of a double-acting planer of 20 years ago that was kept busy all the time. And we know of several trials of reversing planer tools. But the fact that it has not come into use would seem to indicate that the advantages were more apparent than real, on most work.

SHOP EQUIPMENT NEWS

Coulter Vertical, 4-Station, Continuous Diamond-Tool Boring Machine

Increasing adoption of diamond-tool boring, because of its accuracy, high quality finish, and speed in production, has permitted the Automatic Machine Co., Bridgeport, Conn., to announce a Coulter diamond-tool boring machine of the vertical 4-station, revolving-turret type. Designed for large-quantity machining of bearing holes in connecting rods, pistons, bushings, valves, refrigerator units, motor end shields, magneto housings and parts of a similar nature, it is a motor-driven unit self-contained in every respect.

Completely automatic action is featured, the operator unloading and loading the fixtures as they come in turn to the idle position at the front of the machine. As illustrated, the machine is set up for connecting rods with a production of 10 per min., and on this or similar parts the production can be varied by means of change gears.

As shown in the accompanying cross-section, power is taken from the motor shaft by means of a V-belt sheave to a jackshaft at the front of the machine. From the jackshaft power is taken by means of V-belts contacting all boring spindle sheaves except those at the loading position. As the turret revolves, the boring-spindle sheaves leaving the finished position gradually move out of contact with the V-belts so that the spindles will stop before reaching the unloading position. Likewise the spindles just leaving the loading position start to revolve before reaching the first boring position, as their sheaves make advance contact with the V-belts. Thus, the boring spindles continue to revolve from the time they leave the loading station until the boring operation is completed and the unloading station is reached.

To take up the stretch of the large V-belts, the jackshaft is eccentrically mounted, whereas the main motor V-belts are tensioned by an adjustable idler. Spindles are splined to permit the rise and fall of the spindle heads as controlled by the feed cam *A*, mounted on the stationary central column. Feed is by gravity, a bronze shoe *B* riding on the cam. The machine illustrated is cammed for a fast roughing bore on the down stroke and a slow finishing bore on the upward movement. The usual Coulter fine adjustment micrometer spindles are furnished on this machine and spindles of the conventional bearing type or the ball bearing type can be furnished as desired.

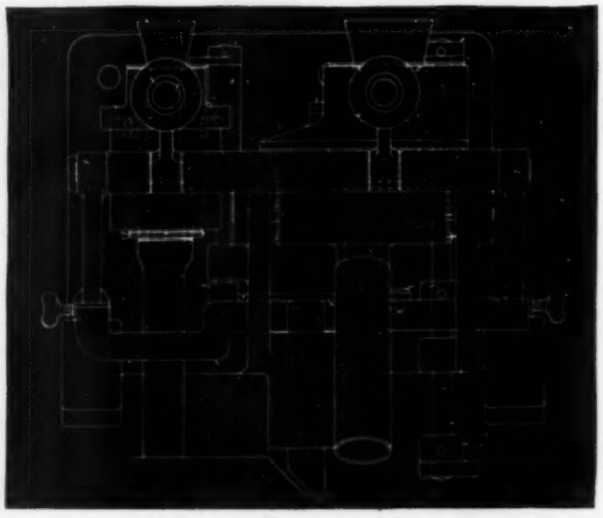
Power for the operation of the turret and other parts is transmitted through the flexible coupling and main vertical drive shaft to the worm at the bottom. This worm and gear drive a cross-shaft on which is mounted the operating clutch. This clutch shaft at the right drives through change gears back to another worm which drives the worm gear attached to the hollow shaft actuating the turret, which revolves at the rate of $2\frac{1}{2}$ r.p.m.

On the other end of the clutch shaft, at the left, power is taken off to drive the lubricant pump and the coolant pump, the latter of $16\frac{1}{2}$ g.p.m. capacity. Coolant is pumped to an annular distributor located in the base. As the turret turns, a port is uncovered which remains open from the time the spindles first start to turn and bore until the boring operation is completed, when the port is again covered and the flow of lubricant stops during the unloading and loading operations.

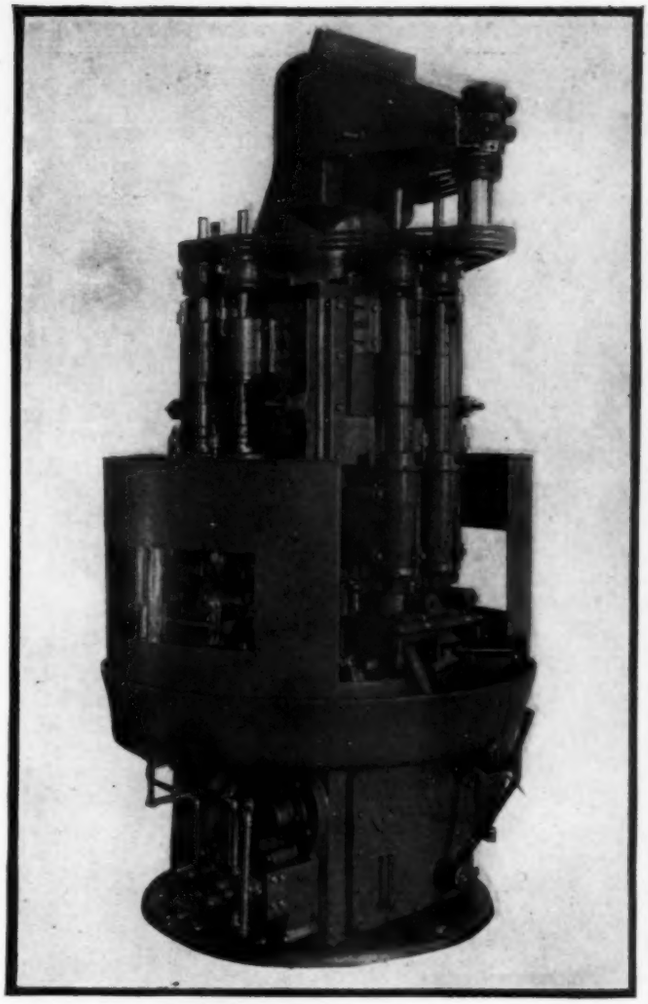
Lubricant is pumped by means of a distributor pipe *D* to the bearings in the head, and flows down to all bearings below and to the gears in the base. Both the lubricant and the coolant are separately filtered before reuse. The revolving turret is carried at the top on an $18\frac{1}{2}$ in. Timken roller bearing and a large annular ball bearing at *C* locates it at the bottom. Ball and roller bearings are extensively used in this machine and the friction of revolving parts reduced to a minimum.

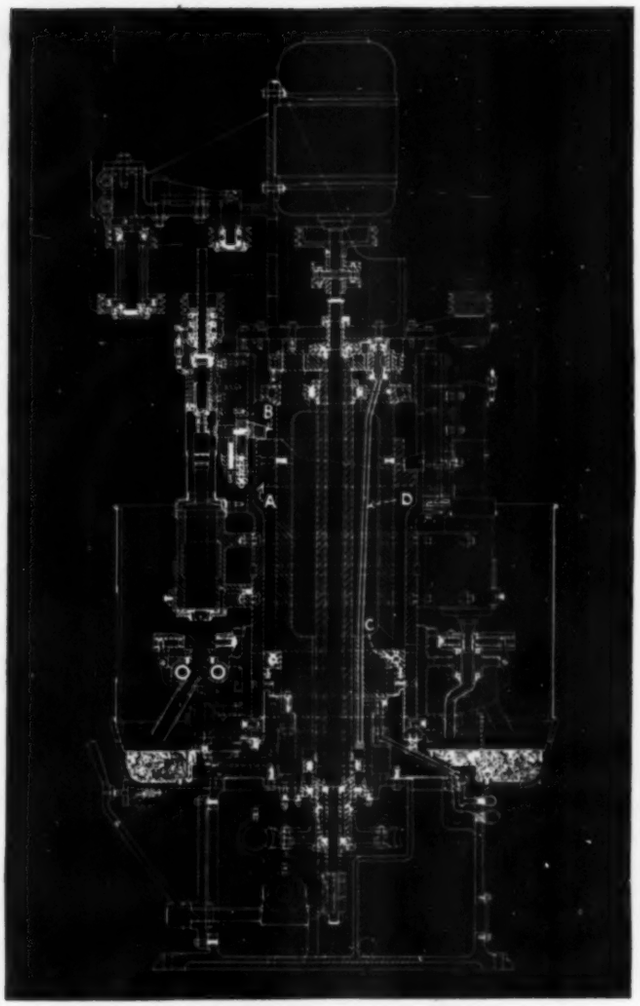
The fixture illustrated was designed for gas-engine connecting rods. The stationary centers to the rear are adjustable, while each front center is movable and actuated by a bell-crank mechanism. On the free end of each bell crank is a weight that is adjustable as to position in order to vary the clamping pressure. For the connecting rod in question, the pressure at each center is 12 lb., while for other parts it will vary, hence the adjustable provision.

The movable centers are inde-



Fixture for connecting rods. The front centers are actuated by bell cranks carrying adjustable weights to effect the desired clamping pressure





pendent of each other, and at the rear of the fixture is a bar that lifts the bell cranks and opens the centers when a shoe makes contact with a segment cam placed in the inner chip trough. This cam is located at the unloading position. Above the centers are placed swinging chip guards which prevent the babbitt and bronze chips from flying out over the fixture and getting mixed below. The chip guards are likewise operated by a segment cam in the inner chip trough. The babbitt chips collect in the outer trough where they are collected by a wiping vane attached to the rotating turret and pushed to a chute through which they fall into proper receptacles, whereas the bronze chips fall into the inner trough where they are likewise pushed by a wiper vane to another chute through which they fall into another receptacle. Screens are placed in each trough to catch the chips, but pass the coolant back to the reservoir in the base.

The spindles are adjustable laterally by means of T-slots, which permit of varying the center distances. Boring bar lubrication is separate from the machine lubrication, being effected by sight-feed oilers.

Heat-treated alloy steels are used where possible, and the speed in production with accuracy and quality of finish, ease of operation with centralized control, sturdy design combined with small floor space are characteristic of the vertical models of this company.

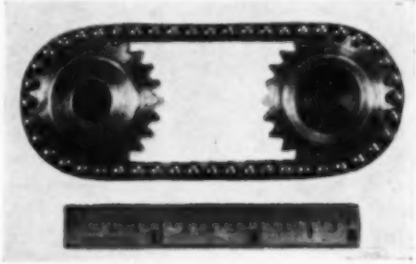
General specifications are: spindle speed 4,300 r.p.m., motor, 15-20 hp., floor space, 57 in. square, height 9 ft. 10 in., turret speed, 2½ r.p.m., production 10 rods per min. (variable), and weight 12,000 lb.

Link-Belt 3/16-In. Pitch Silent Chain

What is said to be the smallest silent chain drive has been announced by the Link-Belt Co., 515 Holmes Ave., Indianapolis, Ind. In appearance it compares with the Link-Belt silent chain, although it is too small to be made in the lined or bushed type. It uses an X-type pin.

The $\frac{3}{16}$-in. pitch chain is made in three types: middle guide, side flanged, and duplex. The middle guide and side flanged chains are employed where all shafts are driven in one direction, and duplex chains where reverse direction is desired on some shaft or shafts, or where adjustment features are required.

This chain has already been used as a transmission medium on such



equipment as photo-tone machines, power cameras, television apparatus, regulators, meters, oil burners and similar equipment where a tiny positive drive is sought from a motor.

Landis 3-In. Motor-Driven Ball-Race Grinder

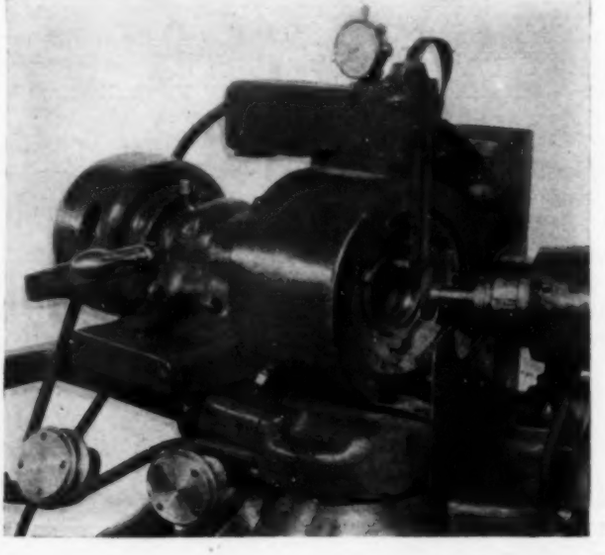
The 3-in. ball-race grinder built by the Landis Tool Co., Waynesboro, Pa., has all of the features found in former machines of the same type, but in addition has been completely motorized and a sizing device has been added. As a result, the machine is adapted to grind outer ball-race grooves on a high production basis,

and it may also be used to grind inner ball-race grooves. Certain other types of miscellaneous radial grinding can also be done.

In a sense, the operation of this machine is semi-automatic. After loading the work and swinging the sizing device around to its operative position, the wheel is moved into the work. The automatic wheel-feed mechanism feeds the wheel steadily, advancing it a predetermined amount twice within the space of one oscillating movement. When the raceway is almost down to size, say within 0.001 in., the automatic wheel-feed mechanism is disengaged by means of a solenoid controlled by the sizing device. The remaining stock is removed without further feeding, and as soon as the raceway is to exact size the wheel moves back a few thousandths from the work. This action is also done automatically, being controlled by another solenoid operated by the sizing device. The operator gives the feed up handwheel a half turn clockwise, moves the wheel away from the work, and reloads.

The grinding wheel spindle runs in duplex-type, preloaded ball bearings. It is driven from a jackshaft, which receives its power from a short driving drum at the rear. The grinding wheel feed can be adjusted to reduce the diameter of the work from 0.00025 in. to 0.0015 in. at the end of each half stroke of the oscillating workhead movement. The conventional Landis feed up handwheel is used. The dove-tailed grinding wheel carriage is moved toward or away from the work by means of a rack and pinion. The workhead is designed to be automatic in its oscillation, and is provided with adjustments which are employed for varying quickly the length of arc of oscillation. The vertical oscillating spindle is hollow and extending through it is a driving shaft. A grooved pulley at the top of the driving shaft transmits power to the left-hand end of the work spindle by means of a round leather belt. Another grooved pulley is placed on the lower end of the driving shaft. The work holding chuck is not furnished as a part of standard equipment, but the lever-operated, three-finger, spring-loaded type shown in the closeup is typical. The sizing device is mounted on the workhead at the rear. A slight downward pressure at the top of the device lowers the diamond-tipped finger sufficiently for it to clear the groove. A dial indicator graduated in tenths of a thousandth is used, and convenient adjustments are provided to permit the operator to change the point at which the feeding in movement stops.

Drive to the entire machine is furnished by a 2-hp., 1,150 r.p.m., constant-speed motor. Through the use of a two-step driving pulley two work speeds and two workhead oscillating speeds are made available. The net weight of the machine is 2,000 lb., and the floor space required is 2 ft. 7 in. x 4 ft. 8 in.



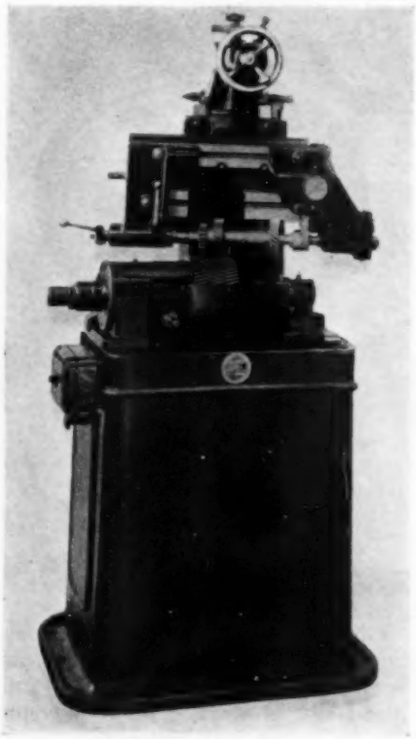
Naudain S-31 Edgewise Bending Machine

For bending channels, angles, bulb angles, tubing, and other shapes edgewise, the Naudain Manufacturing Co., 1001 Rectory Lane, Baltimore, Md., has developed the model S-31 machine. Capacity of this machine is $\frac{1}{4}$x2$\frac{1}{2}$ in. cold on edge in copper or $\frac{1}{2}$x3 in. hot in steel, and with a special head inserted the capacity is 3$\frac{1}{2}$x1 in.

for square bending. No wrenches are required for operating the machine, and it takes a few seconds to change dies for different sizes of edgewise bends.

"Red Ring" Model G.L.F. Gear-Tooth Lapping Machine

Capacity for lapping 7-in. spiral transmission gears is embodied in the model G.L.F. "Red Ring" lapping machine announced by the National Broach & Machine Co., Shoemaker & St. Jean Sts., Detroit, Mich. Pro-



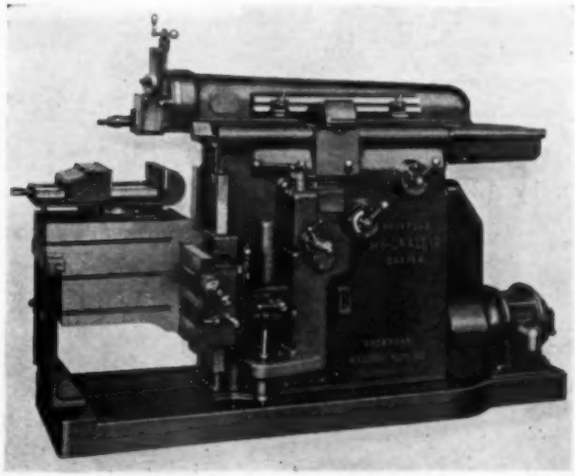
duction time is 3 to 5 min. per gear.

On this machine, the axes of the lap and gear are not parallel. By reciprocating the gear the lapping action is spread across the face. An adjustable hydraulic brake in the tailstock provides uniform load on the lapped surface, and the reversing switch permits lapping on both sides of the teeth. Running of the gear against the lap causes the material to be removed rapidly from the hard gear. The spiral angle is corrected and eccentricity is removed. Index error and tooth curvature are also corrected. An operator can run from three to four machines.

Rockford Hy-Draulic Shaper

Constant cutting speed and tool pressure throughout the stroke are features of the hydraulic shaper announced by the Rockford Machine Tool Co., Rockford, Ill. The maximum capacity of the tool can be used, and ample pressure is proved to cut metal at any selected speed. The rapid reversals of the shaper ram are smooth and shockless. Maximum ratio of the return cutting speed has been set at 3.73 to 1 and the minimum at 1.80 to 1, both greater than the highest return speed used in mechanical-drive shapers. A ball handle enables the operator to change the direction of ram travel at any point instantly, even when the tool is taking a heavy cut.

The number of feeds is unlimited up to a maximum of 0.160 in. The part for selecting the feed resembles a micrometer thimble and its adjustment is necessarily easy. Feed movement cannot begin until the tool has cleared the work on the return stroke, and it takes place so rapidly that it is practically instantaneous. The hydraulic feed is independent of the ram-drive. A pair of dogs governs both the stroke length and its position relative to the work. These dogs can be adjusted quickly and safely by hand while the ram is in motion. Altering the stroke length does not change the cutting speed. The power required is reduced by elimination of mechanical transmission equipment.

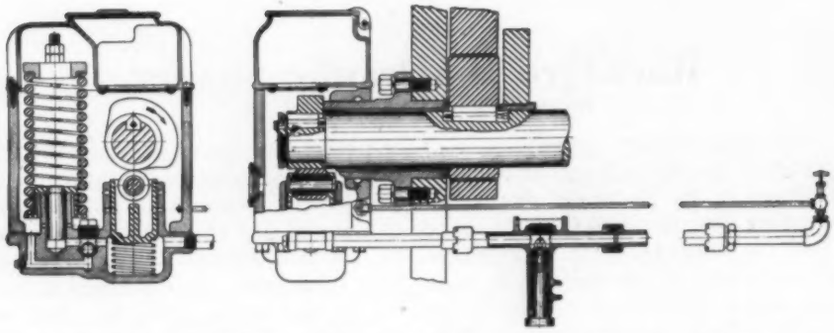


Specifications: Stroke, 25 in. maximum, 1 in. minimum; strokes per minute, 150; cutting speeds, 0-120 ft.; table top, 16x24 in.; table travel, horizontal, 30 in.; table travel, vertical, 14 in.; maximum distance, table to ram, 18 in.; cross feed, 0 to 0.160 in.; vertical feed to head, 7 in.; cutting force when cutting speed is 0 to 60 ft. per min., 5,800 lb.; size of vise jaws, 3x14 in.; vise opens, 15 in.; motor required, 10 hp.; floor space, 8 ft. 3 in. by 4 ft.

Cincinnati All-Steel Shear with Hydraulic Hold-Downs

Additional information has been received from the Cincinnati Shaper Co., Elam St. & Garrard Ave., Cincinnati, O., on the design of hydraulic hold-downs used on its all-steel shears. These shears were described on page 676, Vol. 75. Referring to the accompanying drawings, the hardened and ground steel cam on the end of the eccentric shaft of the shear actuates a piston which displaces the oil in the master cylinder, and forces the oil to the hold-down plungers. Oil pressure is regulated by a spring accumulator, which also acts as a relief valve. Thus, each hold-down plunger delivers the same pressure regardless of its downward travel. If a sheet varies in thickness, the low points will be clamped with the same pressure as the high points, or if two operators are working side-by-side, each cutting short pieces of different gages at the same time, the hold-downs will grip the sheets with the same pressure.

The cam that actuates the piston is designed so that the instant the knife bar completes its downward travel, the piston is allowed to rise, the oil pressure drops, and the plungers are immediately retracted by springs. A spring is provided in each hold-down bracket. This feature makes the operation of the holddowns independent of the upper knife, so



Cross-sections of hold-down mechanism used on the Cincinnati All-Steel Shear. The mechanism is mounted in a box on the left-hand housing and is driven by an eccentric shaft

that the sheet is released and the operator can prepare for the next cut while the knife is still traveling upward.

The accumulator may be regulated by a simple adjustment of two nuts to deliver different pressure to the hold-downs. This feature is important, as it is often necessary to vary the hold-down pressure, particularly on alloy steel sheets and duralumin sheets. The pressure used to clamp a hard sheet will mark a softer one. Each plunger delivers a maximum of 2,000 pounds pressure, making a total of 24,000 pounds for a 12-ft. sheet.

The plungers are located close to the cutting edge of the knives. On smaller sizes they are $\frac{5}{8}$ in. from the edge; on others, $\frac{7}{8}$ in. This prevents waste and makes possible the cutting of narrow strips.

The hold-down bar is stationary, only the hold-down plungers moving to clamp the sheet. This feature contributes to the speed of the shear, which is at the rate of sixty strokes per minute on a $\frac{3}{16}$ in. by 12 ft. shear. Thus, the hold-downs must start down, hold the sheet while the knife cuts, and release when the knife is at the bottom, all in one-half second. The plungers are placed at 12 in. intervals. Each hold-down is a separate assembly and may be removed without disturbing other units.

Victor Molybdenum Heavy-Duty Hacksaw Blade

Hacksaw blades made of molybdenum alloy have been placed on the market by the Victor Saw Works, Inc., Middletown, N. Y. They are intended for heavy-duty operation, both hand and power, and are said to be relatively inexpensive.

National-Cleveland Helical-Gear Checking Device

A device for checking the helix angle of helical gears has been developed by the National Tool Co., West 112th & Madison Ave., Cleveland, Ohio. This device is shown attached to the Model "B" gear checking machine, and may also be attached to the Model "C" machine. In addition, it is furnished as a bench type, or mounted upon a pedestal stand.

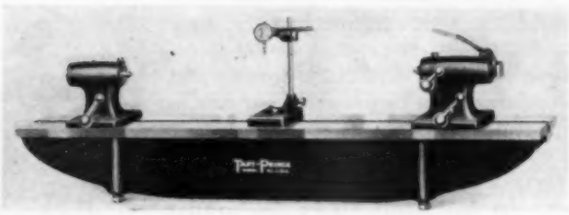
As shown, the helical gear to be tested is mounted upon a stub shaft carried by a slide, which is moved so that the teeth of the gear engage the teeth of the rack. The reading of the angle thus established is taken direct from the large diameter drum, which is graduated in degrees. A vernier is mounted to co-act with the graduated drum, and a magnifying glass is regularly supplied. The rack corresponds to the normal pitch and tooth elements of the gear to be tested.

The device will check right- or left-hand helical gears. When mounted on a pedestal, the device may be placed in the production line which will permit 100 per cent inspection of gears. For production inspection work, the screw and nut that actuate the slide may be eliminated and a lever substituted. This lever may be spring-actuated to move the slide and gear to be inspected into

mesh with the rack. A quick reading is thus obtained, and the lever can be used to disengage the gear immediately. Accuracy to 10 seconds of a degree is embodied in the device.

Taft-Peirce Improved Bench Centers

Improved bench centers for inspection purposes have been placed on the market by The Taft-Peirce Manufacturing Co., Woonsocket, R. I. Maximum length between centers is 36 in. and the swing is 8 in. The bed working surface is ground, and a T-slot aligns the head and tailstocks and provides a means for clamping them in position. Adjustable, hardened studs at the four corners of the



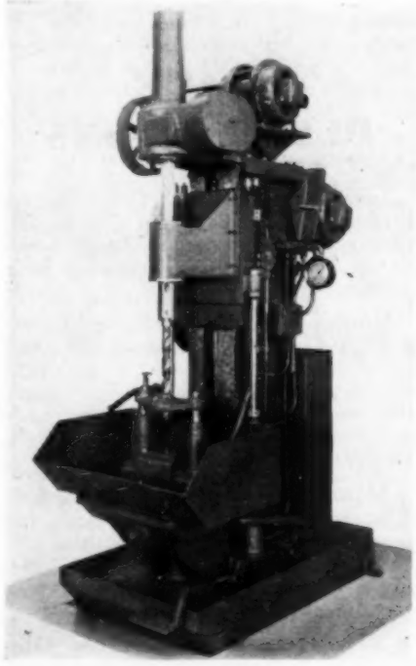
Taft-Peirce Improved Bench Centers for inspection purposes have an 8 in. swing and 36 in. distance between centers

bed provide a method of leveling the bed without the use of shims. Centers are hardened and ground tool steel, one fixed and the other made to be retractable.

A heavy beam section removes all tendency for the bed to spring. Locating the withdrawing lever on top of the tailstock serves to save time in placing work in position.

Baker No. 4-VH Oilfeed Drilling and Boring Machine

A No. 4-VH hydraulic drilling and boring machine adapted to either single-spindle drilling or boring, or for use in connection with an indexing table, has been developed by Baker Bros. Inc., Toledo, Ohio. The



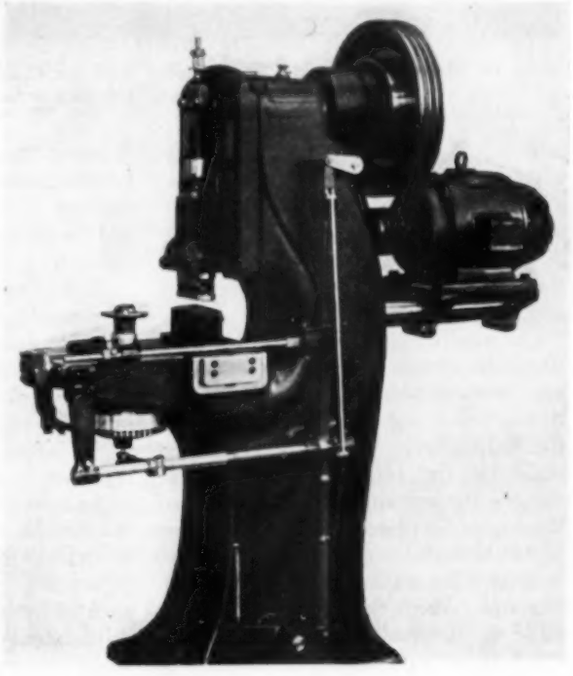
set-up shown is for drilling an automobile cluster gear $1\frac{1}{32}$ in. by $7\frac{1}{2}$ in. long.

The saddle, which carries the head mounting, is actuated by "Twin Pull" construction, consisting of a cylinder mounted on each side and working in unison. The feature of the design is the few number of parts employed, particularly in the spindle drive. Drive is taken from the motor by means of multiple V-belts to a drive bracket carrying four gears. Two of these gears are slip change spur types, which are readily changed to give different speeds, and the other pair are spiral bevels. All gears are of alloy steel, hardened and ground. The shafts are mounted on ball bearings, and provision is made for automatic lubrication while the machine is in operation. The speed changes available range from a minimum of 46 r.p.m., which represents a 60 ft. cutting speed on a 5 in. diameter, up to 836 r.p.m., which represents a cutting speed of 70 ft. on a $\frac{5}{16}$ in. diameter. A 10-hp. motor is supplied. The spindle is multiple splined at the top to fit the spiral-bevel drive gear. The spindle in the housing runs on preloaded ball bearings, and in addition a large radial thrust ball bearing is employed. The spindle end is No. 5 Morse taper, with a standard Baker drive slot for driving boring and facing cutters. Feed for the spindle is obtained by a constant-delivery pump, driven by an independent motor. The cycle of operation is entirely automatic, the operator stepping on the treadle to operate the control valve. The spindle moves down at a rapid traverse of 120 in. per min., trips into feed at any predetermined point, drills to depth and then returns automatically to the upper position. A metering control box permits the feed to be changed instantly.

The machine is shown provided with a standard plain table gibbed to the frame. This table is arranged for vertical adjustment. A box table for bolting to the base can also be furnished, or an alternative is an indexing-type table for multiple operations. All drive belts and moving parts are guarded to comply with all safety regulations.

Schatz Automatic High-Speed Armature Notching Press

Three sizes of a high-speed armature notching press are being offered to electric motor manufacturers by the Schatz Manufacturing Co., Poughkeepsie, N. Y. These three machines will take disks of $29\frac{1}{4}$, 39 and 59 in. in diameter, and have an operating speed up to 650 strokes per minute. The table, on which the indexing mechanism is mounted, is an integral part of the frame. The circulating oil system is built inside the frame, and all important moving members are mounted in ball-bearings or bronze bushings. Rotating move-



ments actuate the indexing mechaism, and the feed is adjustable.

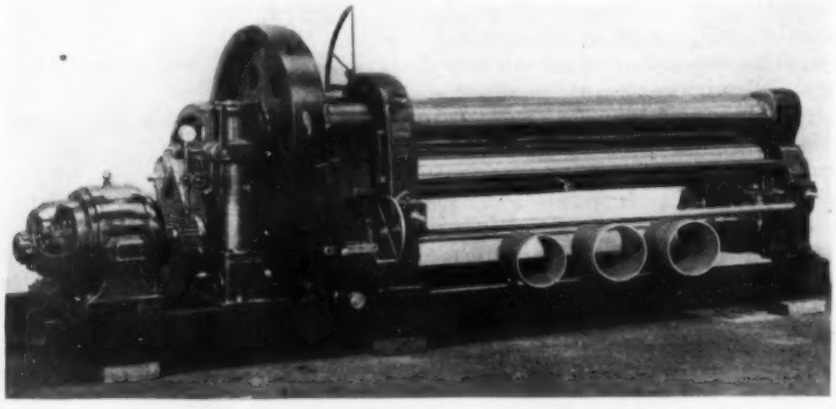
The operating side of the machine is shown. When the treadle is depressed two movements take place. First, the spring on top of the circular table is drawn down so as to hold the disk to be notched, and, second, the indexing mechanism is set in motion.

After a complete cycle has been made, the indexing mechanism stops automatically, the spring-clamp is released and the disk is removd. An attachment can be provided for notching stators as well as rotors. Either a variable-speed motor or motor with speed change box can be used. Drive may be had with either V- or flat belts from the motor.

Drop-end bearing in lower position and upper roll tilted upward to permit withdrawing the cylinder

Schatz Unilateral Plate Bending Roll

The usual flat surfaces at the plate ends are eliminated with the unilateral plate bending roll developed by the Schatz Manufacturing Co., Poughkeepsie, N. Y. The machine illustrated is for rolling class A plate up to 8 ft. 4 in. x ½ in. to a diameter of 13¾ in. The three rolls are mounted in steel housings, the front two rolls being so arranged that the center line of the top roll lies somewhat behind the center line of the lower roll, while the actual bending of the cylinders or cones is done by the adjustable rear bending roll. All three rolls are of the same diameter and positively driven.



Schatz Unilateral Plate Bending Roll for Class A plate up to 8 ft. 4 in. wide x ½ in. thick and for diameters down to 13¾ in.

On machines of small and medium sizes the lower front roll is raised and lowered so as to pinch the plate, this action being effected by means of the handwheel. A finely graduated scale on the left-hand housing indicates the amount of adjustment of the lower front roll for a determined plate thickness. Another scale above indicates the setting of the rear bending roll. With these scales it is possible to determine in advance what the roll settings should be to bend up a certain radius from a given thickness of plate of equal strength, a feature of value when many shells are being produced of similar diameter.

The air cylinder with control lever is placed at the operator's station. Lever movement to the left causes the drop-end bearing to open, and at the same time the top roll is tilted sufficiently upward to permit withdrawing the finished cylinder or cone. Lever movement to the right drops the top roll into its former position and the drop-end bearing closes. The roll setting is not disturbed.

Should two plate ends accidentally be permitted to overlap between the two front rolls, damage to the machine is prevented by a safety device found in each housing. This safety device consists of suitable shearing bolts, which are quickly and easily replaced.

Another feature of this machine is that it employs only one nonreversing motor for all movements. Reversing roll movement is taken care of by inclosed clutches, while the adjustment of the rear bending roll is by means of a multiple-disk friction clutch. The motor required on the machine shown is of 20 hp., and the weight is approximately 20,000 lb. These bending rolls are built in various sizes to take plates from 41 in. to 20 ft. wide and for various thicknesses.

TRADE PUBLICATIONS

INVENTORY DATA. The Barrett Bindery Co., 1328 West Monroe St., Chicago, Ill., has issued a 32-page booklet on "How to Take Inventory in a Manufacturing Plant."

MOTORS. The Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., has issued leaflet 20516 on single-phase motors suitable for application to pumps, compressors, ventilating fans, and other equipment where high-starting and high-accelerating torques are necessary.

MOTORS, STEEL MILL. The General Electric Co., Schenectady, N. Y., has issued Bulletin GEK-71, entitled "A Real Steel-Mill Motor, Type MD," giving a complete description of all constructional features.

METALLOGRAPHIC POLISHING MACHINES. E. Leitz, Inc., 60 East Tenth St., New York, N. Y., has issued Catalog No. 1196, entitled "Guthrie-Leitz Automatic Metallographic Polishing Machines."

STAINLESS ALLOYS. The Central Alloy Division of the Republic Steel Corporation, Massillon, Ohio, has issued a pamphlet, "Arc Welding the Stainless Alloys," giving eleven 8½x11-in. pages of information, together with many photographs of various types of welds, both good and bad, and various types of products fabricated in this manner.

Reference Book Sheet

MAGNESIUM AND ITS ALLOYS

(Continued from last week)

Magnesium alloys can be satisfactorily press forged or hammer forged, but in either case it is desirable to start with extruded forging stock rather than cast billets. Forging billets should be uniformly heated throughout their section before forging, but long soaking is neither necessary nor desirable. Heating ovens or furnaces should be accurately controlled, automatically if possible, to secure uniformly successful results. Because of the low heat capacity of magnesium and the narrow working temperature range, the hot billets should be transferred quickly from the oven to the forging dies, which should be heated. Magnesium alloys containing about 96 per cent magnesium should be forged between 600 to 825 deg. F. Those containing 94 per cent, 650 to 800 deg. F., those containing 92 per cent, 700 to 800 deg. F., and those containing 98½ per cent, 500 to 850 deg. F.

The best mechanical properties are produced with the lowest feasible forging temperature. If the metal is worked too hot, it becomes hot-short and crumbles, while a too low temperature requires excessive pressures and causes cracking. Die pressures, for simple press-forgings, average about 50,000 lb. per sq.in. It is not necessary to anneal or heat-treat alloy forgings, as the maximum properties are developed by the forging operation.

Riveting

Riveted joints on magnesium alloy sections can be made, using magnesium alloy rivets. Rivets should be driven hot (600-800 deg. F.) either by squeezing or, by hammering. Standard aluminum or aluminum alloy rivets can be used where hot riveting is not feasible. The design of riveted magnesium alloy joints, the same as with other metals, is based on the shear strength of the rivet and on the tensile strength and bearing strength of the sheet. The shear strength of magnesium alloy rivets is approximately one-half the tensile strength of the alloy, while the bearing strength of the magnesium alloy sheet is approximately fifty per cent greater than its tensile strength.

Welding

Magnesium alloys can be readily welded with an oxy-acetylene torch. The same general procedure is used as for welding aluminum. *(A M*—pages 885 and 927, Vol. 72.) The filler rod should be of the same approximate composition as the material being welded, although, for example, 92 per cent castings may be welded with the 96 per cent rod. Thicker sections, especially castings, should be carefully preheated before welding. The same precautions to avoid warping and distortion of work due to expansion and contraction should be observed as with aluminum. Welds should be thoroughly cleaned with a brush and hot water immediately after welding in order to remove all traces of flux.

A good welding flux is of utmost importance. Commercial aluminum welding fluxes that have been found satisfactory thus far include: Oxweld Special Sheet Aluminum Flux and No. 22 Welding Flux, the first manufactured by the Oxweld Acetylene Co., and the second by The Aluminum Co. of America. These fluxes may be used in the form of a paste made by mixing two parts of flux with one part of water. The welding rod is then dipped into the paste, or the paste may be brushed upon the rod, as desired. Satisfactory results have also been obtained by dipping rods in molten flux.

Magnesium alloys may be joined with regular spot welding equipment. The pressures will be only about one-half as great as for spot welding steel of the same thickness, but the required current will be greater due to the relatively high electrical conductivity of magnesium alloys. The metal surfaces, to be successfully spot welded, should be free from grease and dirt. Pure copper electrodes have been found satisfactory. Welds in the 96 per cent magnesium sheet show a tensile strength of 500-600 lb. in a 3/32-in. sheet; of 900-1,000 in. 1/8-in. sheet; 1,600-1,900 in 3/16-in. sheet, and 1,900-2,200 in ¼-in. sheet.

Surface Treatment and Finishing

Grease and oil can be removed with organic solvents such as gasoline, naphtha, and carbon tetrachloride, or with regular alkaline metal cleaners as used for cleaning steel. Oxide film and discoloration that may remain after casting or fabricating can be removed by sandblasting, wire brushing, or pickling. Pickling is accomplished by a few seconds dip in a cold sulphuric acid solution. The pickling solution should contain 10 to 25 per cent sulphuric acid to produce a silvery bright surface, but a light matte surface can be obtained by pickling in a 1 to 5 per cent sulphuric acid solution. After pickling, the work should be quickly and thoroughly rinsed in clean cold water, followed by a hot water rinse. Sulphuric acid pickle solutions should be clean and free from heavy metal salts. The alloys can be polished and buffed to produce a beautiful silvery finish. Finer abrasives and softer wheels should be used than for the polishing of harder metals such as steel. A bright finish may also be obtained by the use of steel wool. Polished magnesium eventually assumes a permanent gray finish, unless the silvery finish is preserved by coating.

Magnesium alloy surfaces are best prepared for subsequent painting or lacquering by a simple phosphating treatment, which gives a fine tooth to the metal surface which holds the paint and at the same time affords some additional protection against corrosion. If phosphating is not feasible, a light sandblast can be used prior to painting. Directions for the phosphate treatment of magnesium alloy are: (1) Sandblast, wire brush, or pickle so as to produce a clean metallic surface; (2) Immerse 15 to 20 min. in a hot solution (180 to 210 deg. F.) (made up in a wooden, earthenware, lead or aluminum tank) of 1 lb. monobasic sodium phosphate; 1 gal. water, and (3) Rinse thoroughly in water, dip in hot water, and then dry.

Paints, varnishes, or lacquers can be applied the same as to other metals, by brushing, spraying, or dipping. Spar varnish pigmented with aluminum powder has been found to be effective as a means of protection of magnesium castings to be used on seaplanes or land planes operating on the seaboard. Lacquer, bitumastic paint and synthetic resins are also good. In plating magnesium, acid solutions must be avoided due to their corrosive action on the metal. For copper plating a cyanide solution is used. Parts to be nickel plated should first be given a coating of copper.

Magnesium alloy castings and forgings are not recommended for service where subjected to immersion in salt water. Salt air and salt spray are also destructive to unprotected magnesium alloy parts, particularly in tropical latitudes. Otherwise, these castings and forgings may be considered as having a high degree of corrosion resistance.

Information from Dow Chemical Co., Packard Motor Car Co., Aluminum Co. of America, American Magnesium Corp., and the U. S. Aluminum Co.

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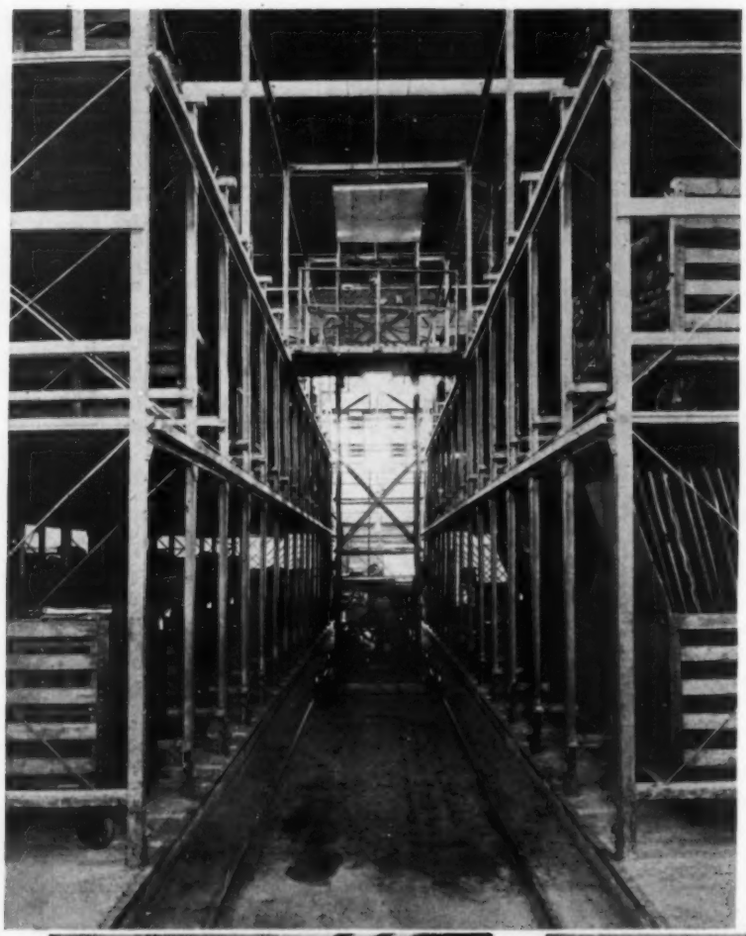
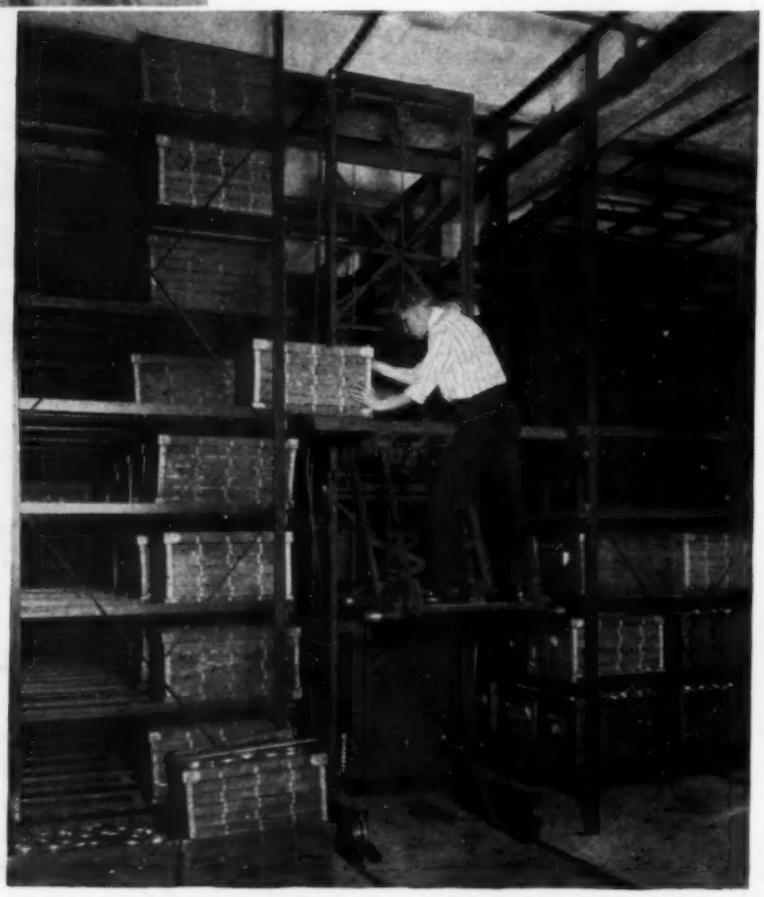


Handling Small Parts In Storage

L. B. MURDOCK

Necessary considerations in planning a system for storing a large quantity of small parts include: ready accessibility of all parts or types of parts, ease of handling containers including transporting and lifting, and lastly safety and economy. Methods here pictured indicate what can be done to simplify the work of carrying parts in process by utilizing all possible vertical area, yet storing containers so that any type of part can be reached without disturbing the others

Entire contents of a Pullman car are packed in each of the 1,500-lb. box trucks at left during car overhaul. The vertical lift runs on a track set in a depressed runway, permitting the lift to be lowered level with the floor. An overhead trolley provides power, and control is by pushbutton. Others run on ordinary casters and are hand operated



Above is a metal stampings storage in a limited space, with trolley-operated lift. At right is a box storage system, the boxes being handled on a roller carriage on the lift. The operators' platform slides forward as the service platform lowers. Other units operate from lamp socket current to do simple tiering

AMERICAN MACHINIST

Editors: KENNETH H. CONDIT AND FRED H. COLVIN

New York, November 26, 1931

VOL. 75 NO. 22

Facts on Installment Selling

It is no longer necessary to argue the merits of installment selling on a purely opinionative basis. The opinion of the man who saw in this method of marketing the direct road to eternal prosperity is worth just exactly as much as the opinion of the man who saw in it the downward path to depression and ultimate ruin, and no more.

Prior to 1929 we had no experience with widely applied installment selling during a severe depression, and no one had a positive answer for the pessimists who foresaw the wreck of the installment financing companies in dull times. We now have that experience, and it is apparently conclusive. Of more than a thousand companies engaged in this business fewer than one can number on the fingers of both hands have gone to the wall. Compare that record with the record of any other business.

This record does not prove, of course, that installment selling has not been or cannot be abused. It can be and it has been. But that is no reason to condemn it. Where it applies to a merchandising transaction it has been proved to be a useful tool. It should be considered as such.

Giving the Foreman Back His Job

Supervisory costs are being closely studied in many plants. And some managements are finding that elaborate systems giving centralized control of production are too costly for curtailed production. In one plant much of the centralized control has been eliminated and the responsibility placed back on the foreman as in the older plan of shop management.

By this method the foreman becomes the virtual head of a small shop which he must manage almost as though it were his own. He develops initiative and, if he is a real leader, becomes more valuable to the firm. There may be other plants where a similar return to older methods might so reduce costs and improve conditions that the more elaborate systems will not be reinstated when the output again approaches normal.

Trade with Russia

In a recent bulletin the head of the Soviet Russian trade body in this country makes several statements that can hardly be disputed. He points out that the immediate losses being suffered by equipment manufacturers through loss of business to competitors in Germany and England are but a fraction of the potential losses. The European manufacturers are becoming more and more firmly established in the new Soviet market and will be hard to displace.

Equally obvious is his statement that future business depends on means for long-time financing of orders. No one who has read J. N. Darling's articles on Russian conditions, or those by J. M. Carmody in *American Machinist,* can doubt that the political leaders of the Soviets are having an extremely difficult time so to order the National economy that funds will be available for the purchase of expensive production equipment. The only recourse under existing conditions has been government guaranteed credits.

Unquestionably, careful study of these facts is of vital importance to American machinery builders. It must not be forgotten, however, that a mutually balanced interchange of Russian raw materials and American manufactured and semi-manufactured products is not going to be quite so simple as some of the Russians seem to believe. Climatically and geographically the two countries are much alike and therefore are capable of producing much the same foodstuffs. And with few exceptions the mineral deposits are more or less

duplicated. This being true, Russia is not going to be able to find many exportable materials that will fill gaps in our own production, and it may well be necessary to look to a three-cornered rather than a dual trade arrangement.

◂◂ CHIPS ▸▸

With the weather men in all sections of the country seemingly in a conspiracy, retail trade shows surprising buoyancy . . . and orders will filter through to metal-working plants as direct and indirect results . . . Irving Fisher's index shows the first stiffening in commodity prices in six weeks . . . Figures just released on department store sales in 239 principal cities show more than a seasonal gain in October over September . . . Increased sales of high grade men's clothing provide employment for 6,000 more workers in the Rochester area . . . California citrus growers sell record-breaking crop for 100,000,000 dollars . . . Lumber orders exceed production 20 per cent during week ending November 7 . . . National Biscuit is erecting Cambridge plant to employ 5,000 men and women . . . Countrywide bank clearings gain, and the President's Emergency Unemployment Relief Committee surpasses all expectations . . . New York City, for example, meets its original 12,000,000 dollar quota and goes forward toward a new 18,000,000 goal . . . None but a cynic and an ingrate would postpone our National Day of Thanksgiving.

President Hoover bids farewell to Signor Grandi and prepares to welcome the new Congress . . . We wonder if he realizes how unanimously his fellow citizens will support him against half-baked congressional interference and legislation . . . Both parties seem agreed that tax increases are inevitable, but those who will be called upon to pay the taxes would prefer more assurance that everything possible by way of governmental economy has been done . . . Evidence accumulates that the banking strain is easing . . . It would ease more quickly were better publicity given the workings of the National Credit Corporation . . . Hoover's Muscle Shoals Commissions recommends a 50-year lease to a private operator, he to be selected by competitive negotiation . . . Association of Railway Executives accepts I.C.C. proposal to use revenues from freight increases to assist financially distressed roads, but suggests important modifications . . . There should be and will be a quick decision . . . U. S. merchandise exports total 205,000,000 dollars in October, against 170,000,000 in September . . . Mark Sullivan feels that union heads are not genuinely hostile to rail wage cuts . . . thinks they are sparring to save their faces.

The tariff epidemic continues to rage in Europe with Great Britain as the latest voluntary victim . . . Parliament broke all records to enable the Board of Trade to impose ad valorem tariffs up to 100 per cent on manufactured and semi-manufactured goods . . . And on goes a 50 per cent duty on vacuum cleaners, razors, typewriters and what have you? . . . Washington, however, assures that total annual American trade involved is but 12,000,000 dollars . . . Japan imitates on a larger scale our Nicaraguan program by further penetration into Manchuria . . . occupies another unspellable city . . . Meanwhile the League and Mr. Dawes make ineffectual gestures . . . And Briand proclaims that the one year truce on arms is effective as of November 1, with Japan among the 45 signatories . . . Soviet Russia, continuing to protest to Japan on the Manchurian occupation, announces its second five-year plan . . . apparently abandons its scheme to "catch up with and surpass the United States" . . . But does not seem to be altering its express resolution to buy everything possible outside the States . . . Amtorg, as direct result, trims New York office space and staff 50 per cent . . . Germany, Russia's new machinery supplier, petitions the World Bank for relief under the Young Plan.

NEW FOR OLD

One New England manufacturer secures from his employees suggestions concerning the use of standard parts in new products. Among such, an efficient and fast selling cocktail shaker has evolved from a staid and law abiding coffee pot.

Unexpected allies to the cause of aviation turn up in the persons of 8,000,000 Shriners who initiate 16,000,000 dollar fund to regain airplane speed record for America . . . U. S. Navy orders 93 observation planes from Chance-Vought . . . 1,744,311 dollars worth . . . Electric Auto-Lite recalls several hundred workers to care for one dollar electric clock business . . . Delaware & Hudson puts 100 new freight cars into service, replacing obsolete units . . . National Tube resumes work in its seamless tube

plant, recalling several hundred workers . . . Youngstown steel makers are stepping up schedules . . . Allis-Chalmers reported unfilled orders for 8,101,000 dollars, October 31, against 7,915,000, September 30 . . . Detroit payrolls are expected to increase 15 per cent on December 1 . . . Briggs Manufacturing reports third quarter net earnings of 524,643 dollars, second quarter, 508,357 . . . American Locomotive is hiring 1,500 men to take care of Lehigh Valley order.

WITHIN THE HOUR

In one plant observed recently, the inspection department is required to check the work of each machine every hour. The number of defects found is marked on a card attached to each machine when these hourly inspections are completed. The maladjustments responsible for defects found must be corrected within the hour following.

The A.S.M.E. will hold its annual meeting in New York City next week. . . Advance reports augur a full attendance . . . E. L. Cord, president of Cord Corporation, resumes presidency of Auburn . . . Boeing Airplane plant in Seattle achieves highest employment rate in twenty months . . . Deere & Company resumes operations . . . Ford Motor purchases five acres along water front of the Potomac . . . no plans divulged . . . McKesson & Robbins will occupy 100,000 square feet more of floor space to accommodate increased business.

THIS WEEK IN *AM*

Duly in accordance with program The Blanchard Machine Company plan for equipment replacement finds itself the leading article of this issue. Its title is "Continuous Replacement at 10 Per Cent Per Year," and its author, Henry K. Spencer, secretary and manager of the company. One need not be forced to admire the determined way in which his management has stood by its principles, holding its depreciation reserves in cash or negotiable securities, and spending it good times or bad.

Some time back we gave you fair warning that we were going to have an exclusive article by an expert American tool and die maker, describing in full his experiences in Soviet Russia. By a fortunate turn of the wheel, we are presenting "An American Toolmaker in Russia" this week (page 816). Walter Wells, the author, who is always a welcome contributor to *AM*, has produced a real climax to the series on U.S.S.R. So far as we know, this is the first article of its kind to appear in any publication.

"Will Color on Machines Pay?" (page 807). Herbert Chase answers the most difficult questions in the problem. The Foreman's Round Table (page 804) presents another of Superintendent Williams's pertinent notices for your consideration and comment. C. W. Hinman, chief tool designer of Kobzy Tool Company, supplies a working description of another of his original dies, this time "A Die for Notching and Forming" (page 810). J. B. Nealey, of American Gas Association, gives some new data on "Forging High-Chrome Steels" (page 812). "Complete Descaling Before Grinding" (page 814) gives comparative figures compiled by The Bullard Company. The author, Frank R. Dedrick, is foreman of the company's grinding department. Thirteen railroads contribute to a symposium on "Making and Keeping Crankpins Square" (page 819). With the Reference Book Sheet (page 833) on "Magnesium and Its Alloys," and "Handling Small Parts in Storage" (page 834) by L. B. Murdock, of Chicago, we top off an issue of which we are proud.

• COMING •

Naturally enough, some issues are more of a pleasure to edit than others, and the one to appear December 3, is a good example. The lion's share of the issue will be taken up by the entry of The Warner & Swasey Company for the *American Machinist* Awards, which is being published strictly in accordance with the alphabetical-by-classes schedule originally outlined. H. P. Bailey, assistant to the president of the company, will be congratulated by all readers for a fine piece of work. Don't miss it.

C. W. Hinman is again going to be represented, if plans do not go astray, with an article describing press tools for manufacturing agricultural machinery forks. Buick has released a story on how coolants are handled in a new and economical way. The Reference Book Sheet will cover "Machining Cast Plastics," the first time, we believe, that the subject has been touched on. Not least, by any means, will be a quick-reading digest of the A.S.M.E. papers most interesting to the industry.

Week after next look for the Awards brief of the Pittsburgh Gear Company.

Progress in Metal-Working and Machinery Markets

UPWARD trends in attitudes and inquiries are reported from almost all sections, but actual increases in orders are still too few and far between . . . Some buying has been done by industrial interests—a healthy sign, but possibly only an indication that a few dollars remain on annual budgets . . . Small tools are also selling more strongly, in previous declines a forerunner of an upturn in general sales . . . Dealers and manufacturers, however, expect little real improvement until the New Year opens, and prospective purchasers have some opportunity to "get the feel" of their own possible markets.

NEW YORK'S little flurry of sales subsided somewhat last week, although inquiries in some cases increased and the Subway orders were finally sonfirmed . . . Small lists include a 3-tool one from the Brooklyn Navy Yard and five for Wassaic, N. Y. schools . . . Cincinnati has nothing new to report . . . Chicago, optimistic, reports release of another Studebaker order, with inquiries improving steadily and closing of some worthwhile sales . . . New England has better inquiries and expects later tool orders from Chance-Vought's large observation-plane order from the Navy . . . Used tools go slowly there, just as in other sections . . . Indianapolis has increases in small machine shop activity, resulting in a few tool purchases . . . Garages, coal fields, radio, and furniture interests are the other buyers.

DETROIT has inquiries for important equipment, but expects little real improvement before the middle of January . . . Canadian sentiment is improving, with future tool prospects good in automobile, lumber, machine, and agricultural plants . . . Buffalo has noted an upward trend, as has the Southern District, but no concrete results have appeared thus far.

NEW YORK

Last week's light flurry of excitement subsided this week, although one or two dealers reported a further upturn in inquiries. Dealers in general feel more optimistic and expect to close some sales on 1931 budgets before the turn of the year. The 52-tool Subway list contracts have finally been awarded. Most tool dealers will benefit to the tune of a tool or two apiece. Contracts have not yet been awarded on the three 24-in. engine lathes for the Brooklyn Navy Yard. The town of Wassaic, N. Y., has issued an inquiry for a drill, a grinder, an 18-in. lathe and two threading machines.

CINCINNATI

Orders booked by machine tool manufacturers and selling agents continue few in number and small in size. Inquiries are confined to single tools for special purposes or for replacement, and users are only buying when they must. Recent developments cause some members of the trade to feel that a better business cycle is approaching.

CHICAGO

The belief that an upward trend is starting is almost unanimous. A gradually increasing number of inquiries, and the closing of some worthwhile sales has inspired considerable optimism. While no marked improvement is looked for until about the middle of January, forecasts are that a general revival of business will bring about the necessity for increased production early in 1932. The report that Studebaker is considering the placing of orders for additional tools in Chicago is borne out by one such order just received.

NEW ENGLAND

Outstanding industrial improvement centers at East Hartford, Conn., where the Chance-Vought Co., received a Navy Department order for 93 planes, representing a valuation of nearly $2,000,000 and assuring normal schedules for 14 months. From a machine tool angle slight improvement was noted, indicated more by inquiries than orders. The outlook from automobile centers is more encouraging with probable new business favoring grinding units. Used tool dealers are disposing of comparatively few machines. A fair demand is apparent from all sections for small tools.

INDIANAPOLIS

Some little increased activity is reported among machine shops. This has resulted in the purchase of some small equipment. Sales also are being made to garages, but the volume is relatively small. The iron and steel trade continues at a low level. Machinery and tool purchases are confined to absolutely required replacements. Some purchases of machine shop equipment are reported from the coal fields. Demand from the radio and furniture industry is somewhat active.

DETROIT

A little better feeling has been detected during the last three weeks. Automobile manufacturers are employing a few more men and are getting under way with the production of the new models. Here or there an inquiry is made on important equipment. Interest is confined to replacement. A good deal of equipment may be replaced by the automobile manufacturers during the next few months. It is mostly on this fact that the dealers base their hopes. They do not expect much business between now and the first of the year, but after that they think the orders will be likely to increase.

CANADA

Much improved sentiment regarding future business is apparent. Constructive factors include the reopening of Canadian Pacific Railway shops at eight centers across Canada, giving work to 8,000 employees; a marked improvement in the domestic demand for steel; slightly increased activity in some of the large machine shops and agricultural implement plants, and general toning up of confidence in the whole business structure as the result of higher prices for wheat and silver. A report from British Columbia states that the need for new machinery and equipment in saw mills and camps in the near future will be very great. Automobile manufacturers are preparing to step up production during the winter months.

BUFFALO

While there is no spurt of business about which dealers may talk, the trend is somewhat upward and the feeling is rather optimistic. Some sales have been made in the last fortnight, and inquiries are stronger than at any time in many months. But there still seems to be some reluctance about closing. The fact that prospective customers are talking about cheaper and more efficient production is taken as a good sign.

SOUTHERN DISTRICT

Conditions show some slight improvement the past fortnight. While the better attitude of dealers is not attributable to any specific cause or the demand from any particular territory, spasmodic inquiry for small tool quantities is on the up-grade. All principal trading points are quiet. New wells have been reported in the oil section near Jackson, Miss., and some hope is held out for future demand from that section. To date, however, the fever pitch at Jackson has never reached serious proportions, and oil has been a by-word thereabouts for more than twenty months. The shipyards are quiet. Relatively little inquiry originates from any of the railroads.

WEEK . BY . WEEK

BUSINESS BAROMETER

Trends in General Business throughout the world

THEODORE H. PRICE
Editor, Commerce and Finance, New York

In addressing English schoolboys recently, Stanley Baldwin said that he was a protectionist because he wanted to keep the American language out of Great Britain. Of course, most Americans sympathize and will cooperate to promote a better use of the English language on both sides of the Atlantic. But perhaps Mr. Baldwin may have made a mistake, for the same paper that carried his address to the schoolboys had another dispatch describing the widespread interest that the "Buy British" campaign, sponsored by the Prince of Wales, has attracted, and the immense increase in the total of Great Britain's exports that would be shown if the British trade throughout the Empire could be increased by only 25 cents per head weekly.

There is no doubt that these figures are making a substantial impression upon even John Bull's hard head, and it is quite possible that we may soon see a change in the policy which Cobden and John Bright succeeded in persuading their countrymen to adopt.

100 Per Cent Ad Valorem

It is the fear that Great Britain may soon take some action along these lines that is making many Americans cautious. The action of Parliament in authorizing the British Board of Trade to raise import duties 100 per cent ad valorem, instantly, is regarded as notice of its readiness to act if America resorts to "dumping" within the limits of England's commercial area.

But most American industrialists understand the tariff game as it has been played by Great Britain up to date, and any very important change in the policy that will be pursued does not seem to be probable. Certainly such a change is not likely to be attempted until the British fiscal policy is more clearly defined and the world has opportunity to learn of any other changes that are likely to be made.

Meantime, other foreign countries feel impelled to go a little slow, and it is becoming more and more certain that most European nations will have to act for themselves in initiating a practicable commercial plan that will carry them through until the expiration of the present moratorium on June 30, 1932.

The shipping industry is more or less demoralized, and the New York papers would seem to indicate that all the great liners are going to be put into the de luxe passenger trade between New York and the West Indies.

Is It War?

From the newspaper headings a state of war between China and Japan seems to exist, but the Western representatives of the belligerent powers both disclaim war, and the League of Nations continues to hold meetings that appear to be superficially peaceful.

It may be possible that they will stop fighting without a treaty of peace. If they were not in such a sad predicament the situation is one which might be used to enliven a comic opera.

In the United States business has been quieter than it was. Everybody is waiting upon Washington. President Hoover has announced that he will recommend the establishment of twelve home loan banks in each of the Federal Reserve districts. These banks will be permitted to loan money to aid in the building of homes and the acquisition of desirable real estate.

No one will deny that the idea is a good one, but we are getting so many sorts of banks that it is a little hard to keep up with them. There is the Federal Reserve System itself; then there are the Federal Land Banks, as well as the Joint Stock Land Banks, over which the Government has a watchful eye, but for whose liabilities it is not directly responsible. Then there is the National Credit Corporation just formed to help the banks in thawing out their loans, and here come the Home Loan Banks which are to loan money to those who want to build homes.

This is all very well, but it presupposes the creation of a great many subsidiary credit institutions whose chief business will be to lend out the Government's money or balances that have been deposited with them because Uncle Sam is supposed to be their guaranty.

But Congress meets on Monday, Dec. 7, and we won't have to wait much longer for some indication of its temper toward all these proposals.

The stock and commodity markets seem to realize this. For the last week they have been quieter. There have been some ups and downs in wheat and corn as well as the other commodities. But fluctuations have not been especially significant, and traders still wait for some intimation of what may be expected from the Federal Farm Board in regard to its holdings of wheat and cotton. Most of the other commodities, including sugar, coffee, hides and leather, and silk, have been relatively quiet.

Distributive trade in the United States has shown but little change during the week. A distinct improvement is expected as soon as Great Britain gives any intimation of the fiscal policy she intends to adopt or her plans with regard to silver are made clear. Perhaps it is too much to say that the influence of the latter article now has greater weight than ever before in this country, and that from now on it will be watched with intense interest all over the world.

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THE BUSINESS WEEK

November 25, 1931

The easing of banking strain from both internal and external sources is still the outstanding sympton of underlying improvement in the domestic situation . . . Prospects of speedy attack on the reparations and private debt problems of Germany are promising in the European picture . . . Surface signs of actual improvement in activity are still confined to the somewhat mysterious out-of-season steadiness in raw steel production, despite slackness in structural and railroad requirements and delay in new-model automotive specifications . . . All other current indications of industrial and trade activity continue to show more than seasonal weakness, depressing our index to lower levels for the first half of November and making it uncertain whether the month as a whole will supply the first faint sign of stabilization or upturn from the October low point which sentiment expects . . . Continued liquidation of bank credit, renewed weakness in security and commodity markets and high commercial mortality records are indications of the difficulties and irregularities of adjustment inevitable at the end of a prolonged and drastic deflation . . . In face of the year-end settlement period, the uncertainties in the foreign situation and the formidable fiscal and other problems which confront the new Congress, it is to be expected that these difficulties will be intensified in the closing weeks of the year and until the usual Spring up-swing supplies new stimulus to business and speculative sentiment.

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Material Trends and Prices . . . .

Warehouse business in all forms of steel is extremely quiet. Mills apparently derived all the available benefits from the recent slight improvement in volume. Structurals and machinery materials lead in demand, at the moment, while other lines appear to be lagging. Business in iron castings, after an appearance of improvement, reacted this week to a condition of marked quietude. Aside from advances which have occurred during the week in tin and zinc, improvement in the non-ferrous metals market is seen in higher prices for scrap now effective in the Chicago area. Copper fell ¼c., following failure to agree on production control.

(All prices as of Nov. 20, 1931)

IRON AND STEEL

	Current	Mo. Ago	Yr. Ago
Pig Iron —			
Birmingham, No. 2, Fdry., per gross ton	$11@$12	$11@$12	$14.00
Buffalo, No. 2, Fdry., per gross ton	17.00	17.00	15.45
Heavy Melting Steel Scrap — Pittsburgh consuming point, No. 1, per gross ton	10.00	10.25	13.00
Furnace Coke — Connellsville, per net ton	2.40	2.40	2.60
Foundry Coke — Connellsville, per net ton	3.25	3.25	3.50
Steel Shapes — Pittsburgh, base, per 100 lb.	1.60	1.60	1.60

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Iron Machinery Castings — Cost in cents per lb. of 100 flywheels, 6-in. face x 24-in. dia., hub not cored, good quality gray iron, weight, 275 lb.:

Chicago	4.62½	Cleveland	4.50
Cincinnati	4.35	Detroit	4.00
New York	4.75		

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Steel Sheets — Prices in cents per lb., del. from warehouse stock (except at Pittsburgh) in lots of 401 to 999 lb., ordered and released for shipment at one time:

	Pitts. Mill	Chicago	Cleveland	New York
Blue annealed, No. 10	1.85	3.20	3.00	3.40
Black sheets, No. 24	2.40	3.55	3.60	3.50
Galvanized, No. 24	2.90	4.10	4.00	4.00

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Seamless Steel Tubing — Cold-drawn mechanical tubing, round, .10 to .30 carbon, in lots of less than 100 ft. or 100 lb., net, at N. Y. warehouse:

Thickness of Wall		Outside Dia. in Inches						
		⅜	½	¾	1	1	1½	1½
Inches	B.w.g.	Price per Foot						
.035	20	$0.15	$0.16	$0.17	$0.18	$0.19	$0.21	$0.23

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Shapes, Plates, Bars, Etc. — Warehouse base prices in cents per lb., del. in lots of 401 to 999 lb., ordered and released for shipment at one time:

	New York	Cleveland	Chicago
Bands	3.40	3.00	2.95
Bars, soft steel	3.10	2.75	2.75
Cold fin., flat or square	3.90	3.60	3.60
Cold fin., round or hexagon	3.40	3.10	3.10
Cold rolled strips	4.95	6.00	5.50
Floor plates	4.85	5.00	5.00
Hoops	3.75	3.65	3.50
Rivets	4.00	4.00	4.00
Shapes	3.10	2.95	3.00
Spring steel	4.00	4.00	4.00
Tank plates	3.10	2.95	3.00

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Stainless Steel — Hot-rolled bars, base, Pittsburgh. 0.12 per cent carbon, cents per lb.:

Chromium 15% and under	19.00	Chromium 18 to 23%	23.00
Chromium 15 to 18%	20.50	Chromium 23 to 30%	28.00

Bolts and Nuts — Discount from list, f.o.b. mills, Birmingham Chicago, Cleveland and Pittsburgh, on machine bolts, all sizes, cut thread; nuts, hot-pressed or cold punched; and lag screws, mill lots 73–10%

NON-FERROUS METALS

Prices following are in cents per lb. for mill shipments in carlots:

Aluminum ingots 99%, N. Y	23.30
Copper, electrolytic, Conn	6.75
Copper wire, base, Chicago and Cleveland	9.37½
Copper wire, base, N. Y	9.25
Lead, pigs, E. St. Louis	3.90
Tin, Straits, pigs, spot, N. Y	23.25
Zinc, slabs, E. St. Louis	3.30

Prices following are in cents per lb., base, N. Y., Chi. and Cleve.:

Brass rods, high	10.75
Brass sheets, high	13.00
Brass tubing, high	16.25
Copper, drawn round	13.62½
Copper sheets	16.12½
Copper tubing	15.62½

Prices following are in cents per lb., del. from N. Y. warehouse:

Babbitt, anti-friction, general service	28.50
Babbitt, com'l, intermediate grade	34.25
Babbitt, genuine, highest grade	43.00
Solder, bar	18.25

Prices following are in cents per lb., base, Huntington, W. Va.:

Monel metal rods, hot rolled	35.00
Monel metal sheets, full finished	42.00
Monel metal tubing, seamless	65.00
Nickel rods, hot rolled	45.00
Nickel sheets, full finished	52.00
Nickel tubing, seamless	75.00

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Scrap Non-Ferrous Metals — Dealers' purchasing prices in cents per lb., f.o.b. cars:

	New York	Cleveland	Chicago
Heavy yellow brass	2.75	2.50	2.75
Light brass	2.25	1.75	2.25
No. 1 rod-brass turnings	3.00	2.75	2.62½
Heavy copper	5.25	4.50	4.25
Light copper	4.25	3.75	3.50

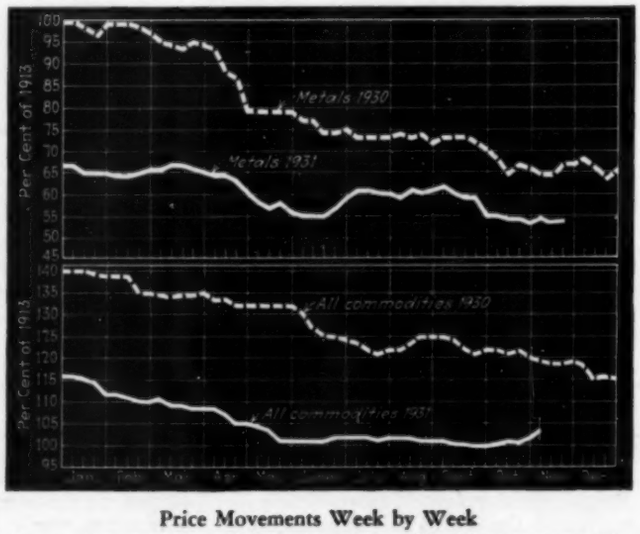
SHOP SUPPLIES

(Prices at warehouse)	New York	Cleveland	Chicago
Abrasive disks, aluminum oxide No. 50 grain, cloth, 6-in. dia., X weight, per 100	$4.37	$4.59	$4.59
Belting, leather, heavy	30–10%	40%	40%
Belting, rubber, trans., Grade 1	60–10–10%	60–10%	60%

Lumber — Per M ft., b.m., 12-16 ft. lengths, delivered, N. Y.:

Crating — Southern pine:
1x4-in ..... $27.00 1x6-in $26.00

Skids—Spruce:
2x4-in..$37.00 3x4-in..$40.00 4x6-in..$42.00 6x6-in ..$50.00



Price Movements Week by Week

Average Price of Raw Metals: Pig Iron, Billet Steel, Copper, Tin, Lead, Zinc—American Machinist
Seventy-Four Commodities Index—The Annalist

NEWS

$10,000,000 in Soviet Machinery Awaits American Repair Parts

American productive machinery valued at more than $10,000,000 lies idle in Soviet workshops, because American producers and officials of the Amtorg Trading Corporation are deadlocked over terms for the purchase of spare parts needed to put the machines in working order, according to the *New York Times*. American manufacturers are insisting on cash payments.

"Our attitude cannot be construed as discriminatory," the official of one company pointed out. We sold the machines on generous terms and are willing to sell more machines on the same basis, because such purchases are classed as "capital investments" of the buyer. Universal practice, however, has always required that the purchase of new parts and replacements by customers be carried through on a cash basis."

One sales agent for a construction machinery company said that Amtorg officials were holding up a requisition sent them last year for $30,000 worth of parts. The order has never been placed, he said, because the producer will not consent to a long-term credit sale. "The machinery has been idle all this time and must remain so because the necessary parts are only made by this one company," he added. "No European manufacturers can furnish the replacements."

Other export agents reported similar conditions affecting large quantities of machinery used for road building, in machine shops and in many other branches of industry. The equipment affected, they explained, was purchased one to two years ago and damaged either through misuse or ignorance on the part of operators.

By Our Paris Correspondent

Coincident with consideration of the Litvinoff "Pact for Non-Economic Aggression," which is to come before the League of Nations during the present year, the International Labor Office has just reviewed the Soviet "Order for the Reorganization of Wages in the Metal Industry," which has just gone into effect.

In future, workers will be paid at piece rates or job rates on a graduated scale in all principal metal transforming trades. In the secondary and auxiliary shops 70 per cent of the workers will be paid at piece rates according to a fixed scale.

The graduated scale is worked out as follows: If the rate paid for the first third of the prescribed task is 100, the second third will be at rate of 120, the last at 150. Any work performed beyond the limits of the program is paid at 200.

Wages will be paid in strict accordance with the work performed, and failure to complete the prescribed task carries corresponding reduction in the wage, even if caused by an interruption of work due to the worker's own fault. Bad work may entail a reduction in the piece-work rate. Auxiliary workers and minor technical staff, such as cleaners, pump hands, watchmen, etc., continue on an hourly rate, but will be entitled to bonuses for good work. The amount of the bonuses will be fixed each month, and paid out of a special fund constituted by payments from the undertaking equivalent to 3 per cent of the total amount of wages.

Heads of workshops, shifts or groups, and foremen, technical workers and engineers will also be entitled to bonuses for the satisfactory performances of the work entrusted to them and for any savings they may bring about.

A new scale of wage rates is established in the metal industry. The number of grades in the scale is fixed at eight instead of seven as previously, and the proportion between the lowest and highest grade, which was formerly 1:2.8, will in future be 1:3.7. The eighth grade will apply to highly skilled workers according to a list to be drawn up by the Supreme Economic Council.

The daily wage rate given below will apply in each grade for the payment of workers who have completed 100 per cent of the prescribed task.

Grade	New Scale (rubles)	Old Scale (rubles)
1	1.70— 3.50	1.30—2.80
2	2.05— 4.25	1.60—3.25
3	2.50— 5.10	2.00—4.10
4	3.00— 6.20	2.40—4.90
5	3.65— 7.50	2.70—5.70
6	4.40— 9.00	3.25—6.50
7	5.60—11.50	3.90—7.25
8	13.00	7.25

The eighth grade was recently introduced for the most highly skilled workers in the largest undertakings.

The monthly salaries of technical workers and engineers are fixed at 175 to 360 rubles ($90 to $185) for engineers and foremen; 225 to 450 rubles ($115 to $231) for assistant chiefs of workshops; and 250 to 650 rubles ($129 to $334) for chiefs of workshops.

National Founders Re-Elect Utley

Whiting Williams, labor expert, recommended to employers Nov. 18 that they "emulate the calmness, the confidence and the initiative of the worker," at the 35th annual meeting of the National Founders Association at the Hotel Astor, New York City. Among business stabilizers Mr. Williams included staggered work, the greater number of women wage earners, a pronounced tendency to move back to the small farm and town, and the absence of the saloon. Mr. Williams predicted that "any trouble this winter is less likely to result from nation-wide revolutionary organization than from the sporadic boiling up of local desperation. I have found the average worker surprisingly unreceptive to radical propaganda."

S. Wells Utley, president of the association, stressed that demands for the dole and for unemployment insurance are all based on the philosophy "that the world owes each one of us a living, but unfortunately there is no single fact in nature which supports this theory." James A. Emery, counsel to the National Association of Manufacturers, argued against all forms of Federal aid for unemployment insurance. Other speakers included A. D. Lynch of the Ohio Brass Co. and John L. Lovett of the Michigan Manufacturers' Association. Mr. Lovett, returned recently from a trip to Russia, urged immediate diplomatic recognition.

The association ended its two-day meeting by re-electing its three principal officers for another term of one year each and naming 15 new members of district committees. The officers re-elected included Mr. Utley of the Detroit Steel Co., president; Carl H. Hofstetter of the Odin Stove Mfg. Co., Erie, Pa., vice-president; and J. M. Taylor of Chicago, secretary. Each district committee, of which there are seven, represents several states. Committeemen elected were:

First District—FRANKLIN R. HOADLEY, Farrel-Birmingham Co., Inc., Ansonia, Conn.; EDWARD F. PARKS, Universal Winding Co., Auburn, R. I.

Second District—E. B. McKENNA, Standard Foundry Co., Buffalo.

THIRD DISTRICT—WILLIAM L. LITLE, Bucyrus-Erie Co., Erie, Pa.; GEORGE T. LADD, United Engineering & Foundry Co., Pittsburgh.

Fourth District—WILLIAM B. CULLEN, Miami Foundry Co., Miamisburg, Ohio.

Fifth District—A. H. HEAD, John Deere Tractor Co., Waterloo, Iowa; W. F. HEESCH, French & Hecht, Inc., Davenport, Iowa; F. ACKERMAN, Curtis Mfg. Co., St. Louis.

Sixth District—CURRY S. PRESCOTT, Prescott & Co., Menominee, Wis.; JOHN M. BRAWLEY, South Park Foundry & Machine Co., St. Paul, Minn.

Seventh District—W. F. TYNES, Hardie-Tynes Mfg. Co., Birmingham, Ala.; C. P. CALDWELL, Caldwell Foundry & Machine Co., Birmingham; H. A. McLELLAN, General Fire Extinguisher Co., Atlanta, Ga.

E. F. DuBrul Retires From N.M.T.B.A. Post

ERNEST F. DUBRUL, general manager of the National Machine Tool Builders' Association since 1921, has retired from this position to engage in the private practice of consultant on finance, marketing and management, it was announced today at the headquarters of the organization, 1415 Enquirer Bldg. Mr. DuBrul, a fellow of the Institute of Management and an associate member of the A.S.M.E., recently won international recognition through his paper on "Research in Management Problems by an American Trade Association," presented in July, 1931, at a meeting of the International Management Institute.

During his administration, the National Machine Tool Builders' Association pioneered in the development of business and management research and its Code of Business Practice won the commendation of the United States Chamber of Commerce, while the National Association of Cost Accountants praised its cost work as being of the highest merit. Its exhibitions of machine tools, in Cleveland, in 1927 and 1929, were outstanding successes.

In a bulletin last week to the members of the association, Mr. DuBrul stated that the strongest proof of the association's success in the past eleven years is that the machine tool industry is in healthier financial condition today than it was in 1921 despite conditions.

Mr. DuBrul is on the A.S.M.E. National Defense Committee and is a member of the American Statistical Association, the American Economic Association, and the American Trade Association Executives, of which he is a former director. He is a graduate of the University of Notre Dame where he received degrees in arts, letters and law. He has served as a director of the University of Cincinnati.

His new offices are on the thirteenth floor of the Enquirer Bldg., Cincinnati.

Die Casters Plan Development

A committee, consisting of W. G. NEWTON, president of the Newton Die Casting Corp., New Haven, Conn., and president of the American Die Casting Institute; CHARLES R. MURRAY, president of Barnhart Brothers & Spindler, a former president of the Institute; and H. R. RINEHART of Philadelphia, the Institute's secretary, conferred recently with Secretary of Commerce LAMONT regarding the problems of their industry and the possibility of inaugurating a development program nationwide in scope.

The industry is relatively young, die castings having been produced in this country only 25 years. During that brief period, the annual volume has constantly expanded until it is now aproximately $25,000,000.

BUSINESS ITEMS

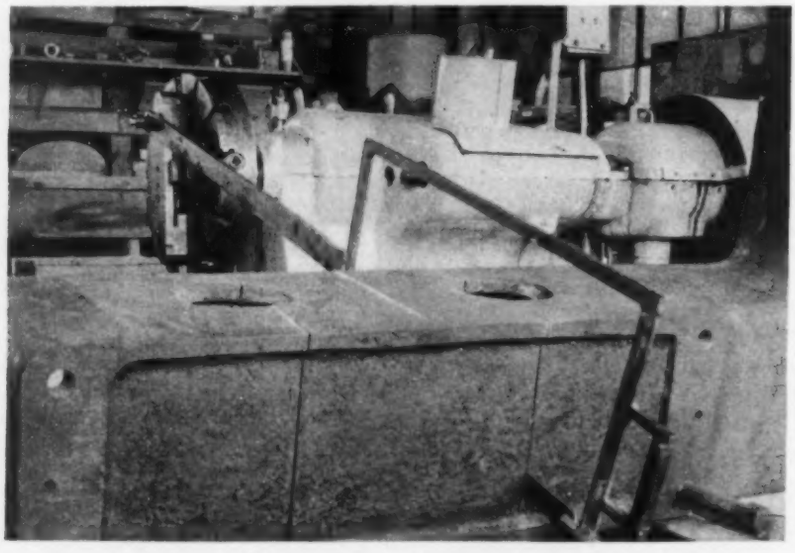
Immediate extension of factory facilities is to be carried out by the Canadian Westinghouse Co. to provide for the manufacture of electrical refrigerators in the plant at Hamilton, Ont. An expenditure of $250,000 is contemplated. This does not involve additional building, but special tools and equipment will be required and factory changes will include a new enamelling and baking plant.

The Pacific Air Motors Corp. has been appointed Pacific Coast parts and service representative for Pratt & Whitney aircraft engines with headquarters at the United Airport, Burbank, Calif.

The Ex-Cell-O Aircraft & Tool Corp., 1200 Oakman Blvd., Detroit has appointed Burton, Griffiths & Co., Ltd., Montgomery St., Sparkbrook, Birmingham, England, as exclusive representative in England.

Peters & Marske, Inc., Michigan City, Ind., has filed articles of incorporation to do a general machine shop business. The company has 250 shares having a par value of $100 a share.

The Industrial Equipment Co., formerly representing the Duriron Co. in the Buffalo territory has been dissolved. The Duriron Co. is opening a direct sales office in Buffalo under the management of GUY A. BAKER from the general office of Duriron at Dayton, Ohio. The office will be located in Room 420, Jackson Bldg., 220 Delaware Ave., Buffalo.



Of welded plate, this impromptu hacksaw cut out a section of a large alternator base for the Meriam Co., Cleveland

PERSONALS

WILLIAM P. ALLEN retired recently as vice-president of E. I. du Pont de Nemours & Co., Wilmington, Del. He continues as a director.

GEORGE H. AUSTIN has been appointed purchasing agent for the Mead-Morrison Mfg. Co. and A. S. Campbell Co. He succeeds W. A. SELLON.

J. B. BERRYMAN, first vice-president, has been elected president of the Crane Co., Chicago, succeeding the late R. T. CRANE, JR.

F. E. BOYLAND has been appointed temporary manager of the Fruehauf Trailer Co., of Canada, Ltd., Toronto, to succeed C. C. GIBSON, who has returned to the head office in Detroit.

EVERITT J. COLE, chief chemist of the Hilo Varnish Corp., Brooklyn, N. Y., has been appointed industrial sales manager.

E. L. CORD, president of the Cord Corp., Chicago, has re-assumed the presidency of the Auburn Automobile Co., a division of the Cord Corp., and the resignation of R. H. FAULKNER as president of Auburn has been accepted. Mr. Faulkner was with Auburn in the sales department prior to Mr. Cord's connection with the company in 1924. He became president of Auburn in February last.

S. HORACE DISSTON, formerly vice-president in charge of sales of Henry Disston & Sons, Inc., Philadelphia, Pa., has been made second vice-president and assistant general manager. Sales activity of the company have been consolidated into three major divisions. DAVID W. JENKINS will continue to direct the sales activities in the Mill Division, sales to the hardware trade will continue under the supervision of GEORGE W. ECKHARDT, and HARRY K. RUTHERFORD has been made sales manager of the Industrial Division.

H. H. EDENS of the Lausen Co., New Holstein, Wis., has resigned to become general manager of the Kiel (Wis.) Machine Co., builder of well-drilling equipment.

FRED EICHENAUER is president of the newly organized Pearl City Tool Co., Muscatine, Iowa, which last week filed articles of incorporation with $40,000 authorized capital, to manufacture and deal in tools and machinery.

F. W. BIERWIRTH has been appointed assistant works manager of the Carnegie Works, Western Electric Co. to succeed F. W. WILLARD, who was elected vice-president of the Nassau Smelting & Refining Co. C. W. GATES has been appointed operating superintendent to succeed Mr. Bierwirth and F. J FEELY has been appointed superintendent of inspection to succeed Mr. Gates.

R. L. GRAY, vice-president and general manager of the Sheffield Steel Corp., Kansas City, Mo., since its organization in 1925 and formerly vice-president of the Kansas City Bolt & Nut Co., has been elected president of Sheffield.

G. H. HARRIS has been promoted to chief engineer of the Michigan Central Railway at St. Thomas, Ont., to succeed J. F. DEIMLING, who has retired. Mr. Harris has been Mr. Deimling's assistant for twelve years.

F. G. LYON has joined the J. B. Morrison Machinery Co. Ex-Cell-O Aircraft & Tool Corp. Canadian representative in Toronto. Mr. Lyon is handling Ex-Cell-O products for Mr. Morrison in the border cities and is located at 1549 Pellissier St., Windsor, Ont.

A. J. MCALLISTER has succeeded DAVID E. ROSS as president of the Fairfield Mfg. Co., Lafayette, Ind. Mr. Ross will continue as president of the Ross Gear & Tool Co., also of Lafayette.

DAVID A. NEMSER, chief metallurgist of the Pratt & Whitney Co., Hartford, Conn., discussed the heat-treatment and physical properties of high-speed steel before the Hartford chapter, A.S.S.T., Nov. 10.

THOMAS P. ROBBINS has been elected president of the Cleveland (Ohio) Hardware Co. He had formerly been vice-president and treasurer, and earlier had been identified with the Reeves Iron Co., Canal Dover, Ohio and the New Philadelphia Iron & Steel Co., New Philadelphia, Ohio.

H. P. RODGERS, 528 Leader Bldg., Cleveland, Ohio, has been appointed Cleveland representative of the Duriron Co., Inc., Dayton, Ohio, manufacturer of acid-resistant metals. Shawinigan Chemical Co., Ltd., Montreal, Canada has been licensed by the Duriron Co. to produce Duriron and Duriron equipment for all of Canada and Newfoundland.

B. F. SHEPHERD, chief metallurgist, Ingersoll-Rand Co., Phillipsburg, N. J., spoke recently before the New York chapter, A.S.S.T., on "Personality in Tool Steels." Said Mr. Shepherd: "That difference in quality of materials which is not usually ascertained until trouble develops in fabrication or in the field, I call 'Steel Personality' or 'Timbre.' Development of tests to determine timbre in alloy steels is much to be desired and the use of such a test on tool steel and the purchase of tool steel with timbre as one of the main criteria of selection rather than the present emphasis upon narrow chemical limits will result in an improved product."

E. O. SESSIONS has formed the E. O. Sessions Co., Ltd., consulting engineers 5022 Sheridan Road, Chicago, Ill.

COUNT IGOR SIKORSKY of the Sikorsky Corp., Stratford, Conn., a subsidiary of the United Aircraft & Transport Co., has been granted a patent for aircraft including a differential aileron control system.

D. V. STRATTON has been elected president of the Johnson Motor Co., Waukegan, Ill., manufacturer of outboard motors. He succeeds WARREN RIPPLE, who has been made chairman of the board in a realignment and reorganization of the company. Mr. Stratton recently was vice-president for sales of the Great Lakes Aircraft Corp. T. F. MURPHY, New York, and V. W. KLEISRATH, South Bend, will act on the executive committee with Mr. Stratton.

FRITZ THYSSEN, chairman of the United Steel Works, Germany sailed for home last week following several weeks visit in this country to attend the Major Industries Conference at Columbia University and to visit various American steel plants.

AXEL WARENSKJOLD, vice-president, Atlas Imperial Diesel Engine Co., Oakland, Calif., has been awarded the Royal Order of St. Olaf by King Haakon VII of Norway in recognition of his "great and manifold services to the Norwegian colony in the San Francisco Bay district."

OBITUARIES

GEORGE A. WILLIAMS, president of the Illinois Manufacturers' Association 1928-1930, was drowned in Lake Decatur, Decatur, Ill. on the afternoon of Nov. 11, when he fell into the lake as he was preparing his motor boat for winter dock. Mr. Williams was president of the Williams Sealing Corp., Decatur, Ill., engaged in world-wide manufacture and distribution of patented metal caps and lids.

JAMES H. CALDWELL, 66, chairman of the board of the Ludlow Valve Mfg. Co., Troy, N. Y. and a director of the Rensselaer Polytechnic Institute, died Nov. 18.

JOEL G. CLEMMER, 68, treasurer of the Lanson Monotype Machine Co., Philadelphia, Pa., died of bronchial pneumonia Nov. 14.

A. L. CULBERTSON, 37, manager of the Furnace Division, Rust Engineering Co., Pittsburgh, Pa. since 1927 died there Nov. 15.

THOMAS HAMILTON, 79, superintendent of the Moore Stove Works, Joliet, Ill., for 20 years prior to 1910, when he retired, died Nov. 9 in Joliet.

EDWARD F. JONES, 70, member of the firm of Gilbert & Bennett Mfg. Co., wire screening manufacturer of Georgetown, Conn., died Nov. 12.

JOHN E. JUDSON, vice-president of Ford, Bacon & Davis, consulting engineers and an engineer for the New Haven Railroad Co., many years ago, died in New Haven Nov. 12.

JAMES P. LYNCH, 76, head of the Lynch Ornamental Iron Co., Baltimore, Md. died Nov. 16 of a heart attack.

THOMAS F. MALONE, 61, treasurer of the Lundin Electric & Machine Co., Boston, died Nov. 15 in a Boston hospital.

ANSON MARK, 64, associated with his brother CLAYTON MARK in the Mark Mfg. Co., with wrought pipe works at Evanston, Ill. and Zanesville, Ohio, died suddenly in his office in Chicago Nov. 12. He was vice-president of Clayton Mark & Co., headed by his brother, organized after their interests in the pipe business had been taken over by the former Steel & Tube Co. of America.

DANIEL TRIGG MCCABE, 82, a former vice-president of the Pennsylvania Railroad Co. died in Columbus, Ohio, Nov. 16. He had been ill for two months from a complication of diseases.

J. OLIVER MORRIS, 46, president of Page Morris, Inc., refrigerator manufacturer of Albany, N. Y. died Nov. 15 there after a major operation. He was formerly vice-president and general manager of the Electric Supply & Equipment Co. and joined Page Morris early in 1929.

ALBERT F. REIDL, 43, president of the Tube Manifold Corp., Buffalo, N. Y. was fatally shot by another hunter while hunting near Little Current, Ont., recently.

WALLACE W. SHEPHERD, chief engineer of the Van Iderstein Co., Long Island City, N. Y., died Nov. 17 there.

ANDREW JAMES TELFER, 68, Pittsburgh manager of the Continental Works of the National Tube Co., a subsidiary of the United States Steel Corp. at McKeesport, Pa., died Nov. 19 at Tampa, Fla., after a year's illness.

JOHN M. YOUNG, 86, Civil War veteran and retired manufacturer, died at his home in Williamsport, Pa., Nov. 14. Several years ago he retired as president of the Williamsport Iron & Nail Co., the Williamsport Rail Co., and the Sweets Steel Co.

MEETINGS

AMERICAN SOCIETY OF MECHANICAL ENGINEERS
Annual meeting, Engineering Societies Bldg., New York, N. Y., Nov. 30-Dec. 5. Calvin W. Rice, secretary, 29 West 39th St., New York, N. Y.

TAYLOR SOCIETY
Annual Meeting, Hotel Pennsylvania, New York City, Dec. 2-4, Dr. H. S. Person, managing director, 29 West 39th St., New York, N. Y.

SOCIETY OF AUTOMOTIVE ENGINEERS
Annual meeting, Book-Cadillac Hotel, Detroit, Mich., Jan. 25-29. John A. C. Warner, secretary, 29 West 39th St., New York, N. Y.

MACHINE REQUIREMENTS AND INDUSTRIAL CONSTRUCTION

Opportunities for Future Business

Calif., Los Angeles—City School District, 1151 South Broadway, plans construction of a 1 story, 70 x 140 ft. vocational shop on South San Pedro St. Estimated cost $100,000. Edwin Bergstrom, Citizens National Bank Bldg., Archt.

Conn., Bridgeport—White Line Bus Corp., 4490 Main St., awarded contract for construction of a 1 story, 80 x 120 ft. bus terminal. Estimated cost $40,000. Noted October 15.

Fla., Miami—Pan-American Airways, Inc., 122 East 42nd St., New York, N. Y., authorized construction of a 1 story, 140 x 140 ft. hangar including repair shop, etc., here. Estimated cost $70,000.

Ga., Atlanta—Warren Co. Inc., plans reconstruction of plant recently destroyed by fire. Loss $50,000.

Ill., Chicago—Auto Parts & Gear Co., 2559 Milwaukee St., plans a 1 story addition to factory. Estimated cost $27,000. I. S. Stern, 185 North Wabash Ave., Archt.

Ill., Chicago—Metal Package Corp., 110 East 42nd. St., New York, N. Y., plans alterations to plant for the manufacture of cans and food containers here. Estimated cost $150,000. Work will be done by day labor and separate contracts.

Ill., Hoopeston—Sprague-Sells Corp., Miller Sells, Mgr., manufacturers of food machinery, awarded contract for construction of a 1 story factory. Estimated cost $150,000. Noted October 22.

Ind., Elkhart—Illinois Carton & Label Co., will receive bids about December 1 for a 1 story 130 x 200 ft. factory building at Clark and Elkhart Sts. Estimated cost $40,000. Private plans. Noted November 12.

Ind., Marion—Osborne Paper Co., awarded contract for construction of a 2 story factory building. Estimated cost $40,000.

Ind., Pendleton — State Prison Board, Indianapolis, plans construction of a 3 story, 40 x 200 ft. industrial building at Indiana State Reformatory here. Estimated cost $85,000.

Ind., Shelbyville—Frank J. Rembusch, manufacturer of screens and metal novelties, plans reconstruction of plant destroyed by fire. Loss $25,000.

Ia., Des Moines—W. D. Caldwell, 1528 Carpenter St., plans construction of a 1 story, 46 x 66 ft. repair and service garage. B. R. Kenworthy, 4300 Hickman St., Archt.

Md., Baltimore—Baltimore Tube Co., 1301 Wicomico St., awarded contract for a 1 story, 110 x 250 ft. addition to factory for the manufacture of seamless brass and copper tubing, etc. Estimated cost $75,000.

Mass., Reading—Ace Art Co., 12 Gould St., will receive bids December 15 for a 2 story addition to factory. Estimated cost $40,000. D. J. Abrahams, 260 Tremont St., Boston, Archt.

Minn., Ada—Larson Motor Co., has work under way on the construction of a 1 story, 25 x 100 ft. repair and service garage. Private plans.

Minn., Cloquet — Berst-Forester-Dixfield Co., Herbert Dickman, Mgr., awarded contract for construction of a 3 story, 106 x 274 ft. factory for the manufacture of pulpwood dishes and other wood specialties. Noted November 12.

Minn., Duluth — A. Hedenberg & Co., 203 Lyceum Bldg., will soon resume work on 1 story, 70 x 100 ft. repair and service garage. Estimated cost $25,000. Work was started last spring but was later postponed.

Minn., Minneapolis—City Water Department, W. B. Heath, Supervisor, will soon receive bids for construction of a 1 story, 66 x 116 ft. water meter repair shop at Third St. S, between Second and Third Aves. Estimated cost $75,000. N. W. Elsberg, City Engr. Noted October 15.

Minn., Minneapolis — Minneapolis-Honeywell Regulator Co., H. W. Sweatt, V. Pres. and Gen. Mgr., 2713 Fourth Ave. S., will build a 1 story, 70 x 120 ft. addition to plant for the manufacture of heat regulators. Estimated cost $20,000.

Neb., Curtis—State Board of Regents, University of Nebraska, L. F. Seaton, Operating Supt., awarded contract for a 1 story, 65 x 100 ft. shop building at State School of Agriculture. Noted November 12.

Nev., Boulder City—Bureau of Reclamation, Denver, Colo., will soon award contract for construction of a 1 story, 71 x 151 ft. service garage here.

N. J., Hackensack—Bergen Auto Co., F. W. Steffens, Pres., 17 Banta Pl., having revised plans prepared for construction of a 2 story, 100 x 140 ft. garage, showroom, etc., at Main St. and Hackensack Ave. Estimated cost $150,000. Arthur E. Dore, 173 Main St., Archt. Noted July 9.

N. J., Newark—Voorhees, Gmelin & Walker, 101 Park Ave., New York, N. Y., Archts., preparing revised plans and will receive bids about December 15 for construction of a 6 story, 134 x 265 ft. warehouse and garage at Fabyan Pl. and Loretta Ave., for New Jersey Bell Telephone Co., G. H. Whitaker, Ch. Engr., 540 Broad St. Estimated cost $500,000. Noted July 30.

N. J., North Bergen—Clyde O. Epperson, c/o North Jersey Industrial Terminal Co., 1827 Bergen Turnpike, preparing preliminary plans for construction of a 1 story factory on 39th St. Estimated cost $39,000. Private plans.

N. J., Woodbridge—B. Farer, 59 Avenal St., will receive bids December 1 for a 2 story addition to factory at Avenal St. and Wolf Pl. Estimated cost $40,000. E. C. Wierzbicki, 175 Smith St., Perth Amboy, Archt. Noted October 22.

N. Y., Brooklyn—Bella Finkel, 1936 78th St., plans construction of a 100 x 260 ft. service garage at Utica Ave. and Lenox Road. Estimated cost $50,000. M. J. Ort, 424 East 149th St., Archt. Maturity after March 1. Project awaiting issuance of permit. Noted September 10.

N. Y., Buffalo—Spring Perch Co., Stratford, Conn., plans construction of two 1 story factory buildings for the manufacture of automobile leaf springs in Lackawanna District here. Estimated cost $125,000.

N. Y., Maspeth—Maspeth Realty Associates, 162 Remsen St., Brooklyn, plans construction of a 1 story, 100 x 200 ft. service garage at Maspeth and 53rd Aves. Estimated cost $50,000.

N. Y., New York—U. S. Trucking Corp., 17 Battery St., will build a garage and service station at 41 East Rivington St. Estimated cost $40,000. Philip Bardes, 230 Grand St., Archt. Work will be done by day labor and separate contracts. Noted November 12.

N. Y., Poughkeepsie—Dept. of Architecture, State Office Bldg., Albany, awarded contract for construction of a work shop and storage building for Department of Public Works here. Noted November 12.

N. Y., Ridgewood—Muller Paper Goods Co., Prospect Ave. and Linden St., will award contract late December for addition to manufacturing plant. H. C. Brucker, 1037 Kossuth Pl., Glendale, Archt.

N. D., Flasher—Morton County, Lee Nichols, Auditor, awarded contract for construction of a 1 story maintenance buliding.

O., Cleveland—Eaton Axle & Spring Co., East 65th St. and Central Ave., awarded contract for a 1 story, 160 x 412 ft. addition to plant for the manufacture of automobile axles, springs, etc. Estimated cost $150,000.

O., Zanesville — Zanesville Stoneware Co., plans installation of a new Harrop tunnel kiln, also construction of annex to house modern equipment and other plant improvements. Estimated total cost $75,000. Private plans.

Tenn., Nashville—Warner Brothers Pictures, Inc., 321 West 44th St., New York, N. Y., plans construction of a 2 story repair and service garage in conjunction with motion picture building here. Estimated cost $500,000. Marr & Holman, Stahlman Bldg., Archts.

Tex., Corpus Christi—Southern Alkali Corp., subsidiary of Pittsburgh Plate Glass Co., Grand Bldg., Pittsburgh and American Cyanamid Co., 535 5th Ave., New York, N. Y., will soon award contract for construction of a chemical plant on 389 acre site near turning basin. Estimated cost approximately $10,000,000. Contractors and dealers, etc., get in touch with owners. Noted August 20.

Va., Alexandria—Ford Motor Co., Schafer Road, Dearborn, Mich., acquired a site and plans construction of an assembly plant on Potomac River here.

Wis., Oregon—State Board of Regents, Madison, awarded contract for construction of an industrial school here. Estimated cost $375,000.

Wis., Superior—Douglas County, A. R. Cole, Clk., awarded contract for construction of a 1 story, 24 x 72 ft. maintenance building.

Equipment Wanted

Calif., San Diego—Bureau of Supplies and Accounts, Navy Dept., Washington, D. C.—will receive bids until December 1 for motor driven pipe threading machine for Navy Yard here. Sched. 6892.

Ill., Alton—Blaske Boat Works—band saw 32 to 36 in. with or without gas engine.

Mass., Chatham—Town, E. B. Sampson, Chn. Bldg. Com.—will receive bids until December 1 for equipment for machine and woodworking shops for proposed 2 story, 60 x 135 ft. school on Main St. Estimated cost $200,000.

Mo., Jefferson City—L. Pliner, 310 Brook St.—8 or 12 in. jointer.

N. Y., Brooklyn—Bureau of Yards & Docks, Navy Dpt., Washington, D. C.—will receive bids until December 1 for motor driven engine lathe for Navy Yard here. Sched. 6922.

O., Cincinnati—Witt Cornice Co., 2118 Winchell St., Cincinnati, O.—modern butt welder, 220 v., 60 cycle to weld material ¼ by 2½ in. for rings 12 to 24 in. diameter.

W. Va., Charleston—Bureau of Yards & Docks, Navy Dept., Washington, D. C.—will receive bids until December 1 for two motor driven drilling machines for Navy Yard here.

Ont., Guelph—Lancashire Felt Co., York Road—machinery and equipment for the manufacture of felt for recently acquired building. Estimated cost $25,000.

Ont., Ottawa—Ottawa Hydro Electric Commission, 75 Laurier Ave. W.—will receive bids until December 18 for one 30 ton and one 3 ton hand operated overhead cranes.

Ont., Toronto—Hoffman Machinery Ltd.—40 in. gap lathe and other machine shop equipment.